APPLIED SCIENCE AND TECHNOLOGY RESEARCH IN EGYPT

Quarterly Report No. 17, Phase II
October-December 1985

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Report prepared by:

Board on Science and Technology for International Development
Office of International Affairs
National Academy of Sciences/National Research Council
Washington, D.C.
January 1986

INTRODUCTION

This is the seventeenth quarterly report, Phase II of the Applied Science and Technology Research Program in Egypt covering the period October-December 1985. The program is supported under Contract NEB-0016-C-00-1058-00 of the United States Agency for International Development (AID) with the National Academy of Sciences/National Research Council (NAS/NRC). Within NAS/NRC the Board on Science and Technology for International Development (BOSTID) is responsible for program implementation. The earlier reports are available from BOSTID, the U.S. AID/Cairo, and the AID Document Library in Washington.

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APPLIED SCIENCE AND TECHNOLOGY RESEARCH PROGRAM IN EGYPT
Phase II: Seventeenth Quarterly Report
October-December 1985

I. Program Policy, Planning and Management

A. Joint Consultative Committee (JCC)

The sixteenth and final meeting of the Joint Consultative Committee (JCC XVI), Applied Science and Technology Research Program, was held at the headquarters of the Academy of Scientific Research and Technology (ASRT) in Cairo, Egypt, November 26-27, 1985

The discussions of the JCC members and invited participants constituted an informal review and assessment of achievements in the Applied Science and Technology Research Program. The following is a summary of some key factors:

1. At the general level

- The program demonstrated the value of a multidisciplinary approach to R&D and fundamentally changed the research methodology of the National Research Centre (NRC), particularly in the agricultural sector
- The program demonstrated the importance of the participation of end-users as full partners in all stages of R&D problem solving
- The importance of socioeconomic aspects of applied research was conclusively demonstrated. (Technical feasibility or success is not the determining factor in most R&D efforts in Egyptian villages)
- Multi-discipinary, multi-institutional R&D requires management structures and methods which are radically different from

older, individual initiated research. Further efforts to develop and adapt new management systems to the ASRT and its affiliated institutes are recommended

- Researchers and clients developed a new appreciation of the skills and roles of each in solving difficult problems and facing issues related to Egypt's 5 year economic development plan.

2. At the specific or institutional level

- The National Research Centre developed new working relationships with the Ministries of Agriculture and of Health, the Governorates, and the Organization for the Development of the Egyptian Village, and thereby opened the door toward achieving a more comprehensive approach to agricultural development on a national scale.

- The National Research Centre demonstrated its talents, resources, and motivation to assist Egyptian industries solve applied R&D problems, thereby paving the way for expanding its activities on the basis of contractual agreements

- The ASRT demonstrated its ability to address policy and national planning issues through the mobilization of expert scientific and technoeconomic manpower resources

- The physical infrastructure and human resources of NRC were significantly strengthened under the Applied Science and Technology Research Program through the acquisition of modern analytical equipment and instrumentation and the training of NRC staff in the organization of new maintenance and repair facilities

- A new, more modern scientific and technical information network for Egypt was designed and began to operate with the ASRT as its central focal point

- The National Institute for Standards of the ASRT and the Egyptian Organization for Standards and Quality Control of the Ministry of Industry were strengthened as centers for standards and measurements for Egyptian industrialization

- The basis was laid for a more comprehensive and integrated program of techno-economic and social development cooperation between the United States and Egyptian governments, reinforcing Egyptian priorities in agricultural and industrial development

A summary of JCC XVI is included as Attachment A to this quarterly report.

B. Research and Development (R&D) Management Systems

1. Introduction

One of the contractual requirements of AID for the Applied Science and Technology Research Program was a review, or assessment of the R&D management training and institutional systems development project. NAS/NRC asked Mr. James Blackledge of Denver, Colorado, U.S.A, to undertake the task because of his recognized experience and expertise in management systems development. Mr. Blackledge is an engineer who has specialized in technoeconomic assessment, analysis of management structure and function, the role of motivation in stimulating productivity, and the adaptation of traditional R&D systems to market-oriented priorities. He has been an advisor to UNIDO/UNDP on evaluation of industrial research and service institutes, and served as a consultant to the Central American Research Institute for Industry in Guatemala City and to the Sao Paulo Institute of Technological Research

in Brazil. He has served AID, the NAS/NRC and NSF on numerous occasions in advisory roles. He assisted AID and NAS/NRC in the design of the R&D management component and is thoroughly familiar with the role, functions and institutional characteristics of the ASRT and the National Research Centre. Mr. Blackledge spent the period from 20 November to 8 December 1985 in Cairo interviewing ASRT and NRC staff members on achievements of the R&D management project. Previously he was in Cairo in 1982 and 1983 advising on Phase II management planning for the Applied Science and Technology Research Program.
Mr. Blackledge's report "The Review and Assessment of the Phase II R&D Management Projects" is included as Attachment B to this quarterly report.

2. Scope of the Assessment

The R&D Management project as a component of the Applied Science and Technology Research Program has emphasized training of senior ASRT and NRC personnel in principles of R&D management, institutionalization of management training within Egyptian institutions, development of management systems in the ASRT and its affiliated institutes, and the application of management practices to R&D performed by these institutions. The assessment reviews the processes of management within the time frame 1983-1985 (3 years).

3. Principal Conclusions and Recommendations

The context within which the conclusions and recommendations are given is one in which there is high level appreciation in ASRT and NRC of the importance of good management systems, a commitment to strengthen management practices in the short-term within the

constraints imposed by the present environment, a commitment to broaden and strengthen management skills of NRC staff at all levels, and openness to experiment with new management methods and encourage participation in the process by all R&D staff members. At the same time top management in the Academy and the National Research Centre recognizes the importance of seeking solutions to longer-term constraints resulting from regulations and situations external to the R&D institutions themselves.

- Summary of Conclusions

a. R&D Management Training As a result of actions catalyzed by the Applied Science and Technology Research Program, there is ample evidence of improved R&D management practices. Institutionalization of R&D management training has occurred; NRC continues a program of short courses and workshops to train scientists, engineers and other professionals in the principles of R&D management.

During Phase I (1979-83) R&D management workshops were conducted for 43 senior personnel of the Egyptian Academy and the National Research Centre at the Denver Research Institute (DRI). An additional DRI course for 87 Egyptians from 20 scientific and technological organizations (including universities) was held in Cairo. Also during Phase I, 127 Egyptians were given training by an all-Egyptian core group that had participated in the DRI workshops.

In Phase II (1983 through 1985) only 14 Egyptians, principally from ASRT and NRC, attended R&D management seminars and workshops in the USA. Over 700 Egyptians were given training in Egypt by the NRC - based core group in R&D management.

b. Institutionalization. Members of the NRC core group of trainers continue to assume greater responsibilities for institutional management as they are promoted to higher technical and scientific positions within NRC and other R&D institutions. A recent (1985) reorganization of NRC management functions occurred whereby core group members have assumed responsibilities for the programming office, marketing office and international affairs activities of the Centre.

At the same time the reorganization presents ASRT and NRC with the problem of expanding the core group of R&D management trainers in order to maintain a continuous high quality R&D management program in Egypt.

Further evidence of the institutionalization of R&D management functions is given by the application of the principles in NRC projects such as More and Better Food, Biogas Technology for Rural Areas, and the Waste Water Management Project.

c. Constraints There are constraints which continue to impede the better application of R&D management principles and institutionalization of R&D management systems. Perhaps the principal deterrent is the lack of incentives and rewards for a full-time career in management within ASRT and its affiliated research institutions, including NRC. It is doubtful that it will be possible to enlist highly talented personnel to assume full-time management positions until such time as an appropriate career path is established,

recognized by top management officials, and suitable remuneration (both tangible and intangible) is provided. Present achievement criteria stress publications in technical journals and base career advancement on that evidence.

A second serious constraint is the inadequate system of administrative and support services. Both ASRT and NRC are working to improve these services through training programs, careful attention during recruitment, etc. External constraints within government service regulations, however, are a major deterrent.

- Recommendations

a. Technical assistance. In the near term both the NRC programming and marketing offices could profit from technical assistance. This is being offered through the Applied Science and Technology Research Program within the remaining months of that program and will be reported in the January-March quarterly report.

b. An expansion of the ASRT/NRC core group of management trainers is a priority task which needs to be addressed.

c. Management information systems need further development and extension in ASRT, NRC, and other affiliated research institutions.

d. Continuation, diversification, and expansion of R&D management training workshops is a priority need. Development of case study materials based upon Egyptian experience should be encouraged. Consideration should be given to the establishment of a more formal training group within the ASRT system that would have a full-time

function. In-service training is another aspect of R&D management which has not been adequately addressed.

e. Within the context of the reorganized NRC marketing office, consideration should be given to re-establishing NRC-industry R&D committees.

f. The evaluation function as an integral part of R&D management should be given further attention and development.

g. The core group should assist ASRT and NRC prepare a long term R&D management training and institutionalization program so that management strengthening efforts may continue after the Applied Science and Technology Research Program has been concluded in September 1986.

II. Other Projects

A. More and Better Food

An executive summary on the impact of the More and Better Food project on socioeconomic and nutritional aspects of life in the villages of Omar Makram and Kafr El Khadra was written by Drs. Osman Galal, Amin Abdou, and Abdel Rahman El Seidi of the National Research Centre in Cairo in collaboration with Dr. Gail Harrison of the Department of Family and Community Medicine, School of Medicine, University of Arizona, Tucson, Arizona. The summary is included as Attachment C to this quarterly report.

Analysis of data on agricultural commodity production and use reveals that the increased production of wheat, corn, peanuts, rice,

fruit and other crops was reflected as an increase in food consumption in participating households relative to those households that did not participate in the MBF. Moreover, production increases were utilized in ways which might not be detected, or would be underestimated, if the analysis focused on household income alone. Increases in production of staple crops were followed not only by increases in household consumption but also by increased storage of those commodities for animal feed. The participating farmers managed their resources to maximize economic flexibility (consumption and sales).

Data on the disposal of the wheat crops were collected on the proportion going to home consumption, storage as seed for future crops, as straw for animal feed, and as sales. Participating households consumed a greater share of wheat from their own production than non-participants (35% vs 29% in Omar Makram; 66% vs 54% in Kafr El Khadra). Participants stored more wheat than non-participants in both communities; the quantity of straw stored for animal feed was significantly greater for participants than for non-participants in Kafr El Khadra but in Omar Makram the amount of straw stored was directly dependent on the number of cattle owned.

For 1984, corn (maize) productivity for both villages was significantly greater for participants than for non participants. Disposal of corn was principally for animal feed, sales and household use (mixed with wheat for baking bread). In all cases the farmer used corn first to feed his animals with any excess going to home

consumption and sales. The increased productivity of corn enjoyed by MBF participants thus directly affected the amount used by the family both in direct and indirect consumption.

In summary, for the two important staple grains (wheat and corn), increased productivity was reflected in increases in stored grain and stored animal feed, and thus in greater self-sufficiency. Given the finding during the village base-line studies that reliance on home production was associated with relatively more adequate household food intake, the analysis to date supports the qualitative observation that those in participating households had better diets than those who for whatever reason did not participate in the MBF project.

The studies of the impact of the MBF project on socioeconomic and nutritional characteristics of life in the two villages are scheduled to be completed and fully reported in May 1986.

B. Quarterly Summary
Applied Science and Technology Research Program

Project	Activities	Status/Remarks
1. Program Policy, Planning and Management		
1.1 JCC XVI (Final meeting)	Held in Cairo November 26-27, 1985	Summary Report Completed, Attachment A
1.2 R&D Mgt	Visit by consultant, Mr. James Blackledge to Cairo to assess projects results and recommend final activities under contract.	Summary Report Attachment B

Project	Activities	Status/Remarks
2. Demonstration/R&D Projects		
2.1 More & Better Food (MBF Executive Summary Report	• Working visit by Dr. Amin Abdou and Dr. Abdel El Seidi to Univ. of Arizona and Tennessee State University for data production and analysis of the impact of MBF activities on socioeconomic and nutritional characteristics in demonstration villages • Working visit to Cairo by consultant Dr. Troy Wakefield Tennessee State University to help complete socioeconomic and nutritional aspects of MBF report.	Attachment C
2.2 Technoeconomic Evaluation of Irrigation	• Continuation of field activities; preparation for visit to U.S.A. in February 1986	
2.3 Biogas Technology	o Proceedings of the 1984 Workshop scheduled for publication by Elsevier (London), May 1986.	
2.4. Pharmaceutical Chemicals	• Beginning of pilot plant runs at El Nasr Pharmaceutical Co. • Visit by consultant (F. Cunningham, Upjohn Co., USA) to Egypt to advise on preliminary pilot plant operations.	
2.5. Bentonite Clays	• The Bentonite clay group at CMRI is completing activities in areas of the R&D: soils, foundry, oil well drilling, and vegetable oil bleaching. • CMRDI group completed an advisory visit to Tunisia on use of bentonites for soil reclamation.	
2.6 Red Fisheries	Activities continuing.	Interim Report, October 1985

ATTACHMENT A

Summary Report
Sixteenth Meeting
Joint Consultative Committee
Applied Science and Technology Research Program

Academy of Scientific Research and Technology (Egypt)
National Research Council (U.S.A.)
Cairo, Egypt
November 26-27, 1985

Board on Science and Technology for International Development
Office of International Affairs
National Academy of Sciences/National Research Council
Washington, D.C. 20418, U.S.A.

Sixteenth Meeting, Joint Consultative Committee
Applied Science and Technology Research Program
Egyptian Academy of Scientific Research and Technology (ASRT)
National Research Centre (NRC/Cairo)
U.S. National Academy of Sciences, National Research Council (NAS/NRC)

Cairo, Egypt November 26-27, 1985

I. Introduction

The sixteenth and final meeting of the Joint Consultative Committee (JCC-XVI), Applied Science and Technology Research Program, sponsored by the Government of Egypt through the Academy of Scientific Research and Technology (ASRT) and the U.S. Agency for International Development (AID) was held in Cairo, Egypt at the headquarters of the ASRT, November 26-27, 1985.

The agenda for JCC XVI (Annex A) included a review of ongoing projects, all scheduled for completion by summer 1986; an assessment of mechanisms for coordination used in the program; a discussion of achievements in the context of broader socio-economic goals of Egypt; and testimony supporting continuing scientific and technological cooperation between Egypt and the United States.

II. Program Reviews

A. Dr. M. Kamel, President, ASRT

In 1977 when an opportunity arose for a special program of collaboration in S&T between Egypt and the United States three conditions prevailed in Egypt which required priority attention. These were:

- Egyptian S&T manpower and Egyptian R&D institutions were engaged in activities that had only a marginal impact on socio-economic development needs of the country

- There was a general lack of communication and coordination among Egyptian R&D institutions, and between those institutions and end-users.

- In most laboratories S&T infrastructure (instrumentation, access to computers, and modern equipment for R&D) were lacking or very much outdated.

The Applied Science and Technology Research Program was proposed as a cooperative effort to address the Egyptian situation. All projects which would receive assistance under the program had to meet three criteria: (a) participation of the end-user; (b) use of simple, cost-effective, and appropriate technologies; and (c) application of modern methods of management.

In his formal presentation to JCC members Dr. Kamel did not enumerate or review the individual projects in the program in detail. He described a number of significant achievements and benefits, however, by giving the following illustrations:

- In agriculture, the More and Better Food Program of NRC/Cairo demonstrated food productivity increases in the cooperative villages leading to adoption of the new methods for tomato production in 3 governorates, for corn in 5 governorates, and for peanuts in 2 major production areas.

- In industrial R&D applications, the textiles project results for wool scouring was adopted by the Egyptian end-user and incorporated into its production plant; the pharmaceuticals project demonstrated the practical effort of cooperative R&D on the part of NRC/Cairo and Misr Pharmaceutical Chemicals Company; and the phosphates project lead to 10 industry sponsored and financed R&D projects with the NRC/Cairo team.

- In infrastructure development the Applied Science and Technology Research Program created a Cairo-based Egyptian S&T information nucleus linked to major data bases and information systems worldwide; focused and coordinated resources from three Egyptian institutions on standards, measurements and quality control methods to improve the quality and reliability of goods produced by the Egyptian industrial sector; and established 10 centers for repair and maintenance of scientific equipment in 8 universities, the Scientific Instrumentation Center, and the National Research Centre.

B. Dr. Gilbert White, Chairman of the U.S. JCC panel

On behalf of the U.S. members of the JCC Dr. White commended ASRT and NRC/Cairo for the results achieved in the program. He suggested that the program has shown that:

- S&T for development requires genuine partnership between research institutes and end-users; both groups must contribute to program design, implementation, adaptation, and follow-up.

- S&T for development requires commitment at the highest levels of government to assure that knowledge gained and lessons learned will be broadly applied, and that economic gains are widely shared.

- S&T for development requires infrastructure in terms of information, maintenance and repair capability, standards and quality control as well as physical facilities and equipment.

Dr. White went on to say that the task involved many people and institutions on the American side as well as in Egypt. He gave the following illustrations:

- Over 4000 training days in the USA were completed by Egyptian scientists, engineers, economists and other specialists

- More than 300 US institutions and organizations contributed to the program including 110 universities, 55 state or federal government laboratories or research organizations, 75 industry R&D groups and nearly 75 other private non profit associations and institutions.

- There were more than 600 days of paid consultant time in Egypt by U.S. specialists and nearly 1200 pro-bono person-days of services from the U.S. scientific community.

C. Dr. Bernard Wilder, Associate Director U.S. Aid Mission in Egypt

As seen by U.S. AID, achievements of the Applied Science and Technology Research program include the following:

- Egyptian manpower resources were strengthened, particularly in multi-disciplinary approaches to S&T for development

- Institutional capacities were strengthened, R&D productivity was improved and linked more directly to development priorities

- A scientific and technical information system was begun with links to world wide information networks

- Centers for maintenance and repair of scientific equipment and instrumentation were begun

- Changes in applied research design and management are being introduced beyond this immediate program

- The advisory group mechanism (JCC) proved to be a useful formula for this program; the mechanism may have wider validity for other cooperative S&T programs.

D. Remarks by Dr. A.S. El Nockrashy, Program Coordinator, ASRT

In his earlier remarks, Dr. Kamel noted three conditions of R&D in Egypt which required specific attention under the Applied Science and Technology Research Program (See page 3) These conditions constituted "constraints" which were matched by program objectives:

Constraints (Conditions of R&D in Egypt in 1977)	Program Objectives (To alleviate the constraints)
1. S&T Manpower and S&T institutions exhibited marginal impact on socioeconomic development	• Engage scientists, engineers, economists, in problem solving R&D
	• Encourage attitudinal and institutional changes on the R&D process through training and exchange programs.

2. Lack of coordination between R&D institutes, lack of coordination between institutes and end users.	• Establish new links between institutes through multi-disciplinary, multi-institutional R&D. • Establish more effective joint programs between researchers and end-users
3. Weak S&T support services and infrastructure	• Identify, select and install modern equipment and instrumentation in project R&D laboratories • Establish an Egyptian S&T information network • Establish maintenance and repair facilities and train personnel • Strengthen standards, measurement and quality control capacity

An analytical review of specific program elements and achievements is being prepared as part of the end-of-project documentation for the Applied Science and Technology Research Program. The following more generalized conclusions constitute a set of "lessons learned" which may be applied in other S&T for development activities:

• Although the program demonstrated the value of strong links between R&D originators and end-users, further efforts are needed to bridge the two groups, define the responsibilities of each, and provide specific opportunities to work together under the umbrella of the ASRT.

• The program created an awareness of the importance of the socioeconomic dimensions of R&D projects. Egyptian S&T institutions need additional qualified staff to incorporate socioeconomic analyses and field activities to a far greater degree in multidisciplinary programs.

• R&D management training and institutional development was an important element introduced by the program. Further efforts in management training and systems development are needed in Egypt.

• R&D institutions demonstrated their capability to provide personnel and services for problem solving to Egyptian agriculture and industry. These indigenous consultancy services need additional encouragement and support.

- The Applied Science and Technology Research Program demonstrated the success of new management and coordination mechanisms within R&D institutes and between institutes that have R&D functions but are administratively responsible to different ministries of the Egyptian government. Further support for program initiatives to extend these new mechanisms to other development problems are warrented.

- The S&T Information project is an example of a program addressing an important high technology area for socioeconomic development. Maintenance and growth of the modest national network requires a well coordinated effort, an appropriate management and control system, and consistent funding for personnel, equipment and operation.

- The centers which were created for maintenance and repair (M&R) of scientific instrumentation also constitute an element of basic infrastructure which are necessary for R&D. The centers require continued nurture, funds, high level commitment, and appropriate management oversight. Expansion of the network of M&R centers is a high priority.

- The experience of the National Research Centre in multi-disciplinary multi-institutional programs merits documentation as a case study.

E. Observations Arising from the Discussion of JCC Members

- The Applied Science and Technology Program shows impressive accomplishments arising from solid experience and deserves careful documentation so that others may know and benefit from those accomplishments.

- The impact of program achievements has been dramatic where applied, but this has been on a limited scale. Means need to be found to extend the achievements far more broadly in the country. This is neither easy nor is the method to do so straightforward.

- In the last days of 1985 Egypt is engaged in the preparation of a new 5-year national development plan. S&T has a role in the plan; achievements from the Applied Science and Technology Research Program need to be incorporated into the new 5-year plan.

- The program has shown its greatest positive effect in agriculture and rural development. There has been less evidence arising from the links with traditional industries and almost no evidence of links with the high technology industries. More emphasis needs to be given in the areas of industrial problem solving.

- The program has shown the importance of management and marketing in linking S&T producers and end-users; additional support needs to be given specifically in these areas.

• The Egyptian Ministry of Planning and International Cooperation constantly reviews programs and asks questions such as the following:

a). Why are feasibility studies and project evaluations continually put forth as "solutions" to development problems when they are merely steps to implementation and action?

b). Why is expensive training so extensively proposed, partucularly in the U.S.A? Cannot most of the training be accomplished in Egypt?

c. Why does technical assistance and consulting so often bring persons at high cost from outside Egypt while local Egyptian experts are underutilized?

F. Concluding Remarks

• Gilbert White, for the U.S. panel members expressed deep respect for the development capabilities, achievements and prospects for further progress of the Egyptian scientific and technical community under the leadership of the Academy of Scientific Research and Technology.

The NAS/NRC considers the partnership with the ASRT to have been fruitful and mutually supportive. It is hoped that collaboration in S&T may continue in appropriate ways. The American side looks to their Egyptian colleagues to suggest what might be helpful for the future.

Sincere thanks were given for the opportunity to share in the work of the Applied Science and Technology Research Program in Egypt.

• Dr.Ibrahim Badran, for the Egyptian panel members, reaffirmed the value of the Egyptian-U.S. partnership in S&T for development. Although the formal program is nearing its completion, this bridge of friendship among the JCC members and this spirit of collaboration merits continuation and the support of the two governments. Dr. Badran suggested that a letter be sent to the Prime Minister expressing these conclusions of solidarity.

Further, Dr. Badran urged that the story of the accomplishments of the program be told in a manner that is easily grasped by busy persons in government, industry and agriculture. He recommended that priority be given to the task and that a summary report be published within thirty days.

• Dr. M. Kamel, as JCC chairman and as the official spokesman of the Government of Egypt expressed his endorsement of the words of Dr. Badran and Dr. White. He expressed profound appreciation to the JCC members, past and present, for their work and their spirit of cooperation. He expressed deep appreciation to all engaged in the work

of the program - as researchers, managers, administrators and helpers. In concluding he gave special thanks to the U.S. Agency for International Development and to the Govenrment of Egypt for their financial sponsorship over the years of the Applied Science and Technology Research Program.

ANNEX A

AGENDA

Sixteenth Meeting, Joint Consultative Committee (JCC-XVI)
Applied Science and Technology Research Program

Cairo, Egypt — November 26-27, 1985

Participants

Egyptian Academy of Scientific Research and Technology (ASRT)
National Research Center (NRC/Cairo)
U.S. National Academy of Sciences/National Research Council (NAS/NRC)

Tuesday, November 26, 1985

10:00 a.m.	Welcome and Remarks	M. Kamel President, ASRT Chairman, JCC
10:15 a.m.	Response	G. White Chairman, U.S. Panel
10:25 a.m.	Response	B. Wilder Assoc. Director
10:35 a.m.	Program Achievements and Impact	A.S. El-Nockrashy Program Coordinator, ASRT
11:00 a.m.	More and Better Food Program	O. Galal NRC/Cairo
11:30 a.m.	Scientific and Technical Information (STI) Program	A. Abdel Baset STI/Cairo
12:00 noon	Visit to STI Program facilities, ASRT On-line demonstration of Information search and retrieval	M. Abdel Baset Program Staff
12:30 p.m.	Adjourn for Lunch	

2:00 p.m.	a. The Applied Science & Technology Research Program and the NRC/Cairo	M.B.E. Fayez Director, NRC/Cairo
	b. The Pharmaceutical Chemicals R&D Project	
2:30 p.m.	Red Sea Fisheries	A.F. Abdel Latif Vice Pres., ASRT
3:00 p.m.	Biogas Technology	M.M. El Halwagi Proj. Director, NRC/Cairo
3:30 p.m.	Lessons Learned and Applications of the Phosphate Fertilizers and Bentonite Clays R&D Projects	
3:45 p.m.	Instrumentation	M. Shaltoot Pro. Director, ASRT
4:15 p.m.	Standards & Measures	A.F. Davoud Director Natl Inst. Standards F. Sobhy Director Org. for Standards & Quality Control K. Heinrich U.S. National Bureau of Standards
5:15 p.m.	Adjourn	

Wednesday, November 27, 1985

11:00 a.m. Executive Session
JCC panel addressed the following issues:

- Experience gained and lessons learned
- Problems of the past and solutions
- Areas that need follow up and continuity
- New areas for S&T cooperation
- Follow-up on Airlie House meeting
- Future Egypt-U.S. relationship in S&T
- Modes of action

12: 30 p.m. Ajourn

1:30 p.m. Lunch in honor of JCC Members
Host: Dr. Bernard Wilder, Assoc. Director
U.S. AID Mission/Cairo

ANNEX B

LIST OF PARTICIPANTS, INVITED GUESTS AND OBSERVERS
Sixteenth Meeting
Joint Consultative Committee (JCC XVI)
Applied Science and Technology Research Program

Cairo, Egypt November 26-27, 1985

Egyptian JCC Members

Dr. Mohamed Kamel (Chairman, JCC)
President, Academy of Scientific Research and Technology, ASRT

Dr. Ibrahim Badran
Counselor, Office of the Prime Minister

Dr. Ibrahim Helmy Abdel Rahman
Counselor, Office of the Prime Minister

Dr. Abdel Aziz Hegazy
Counseor, ASRT and
former Prime Minister

Dr. Hassan Ismail
Counselor, ASRT

Dr. Mohamed Kassas
Professor of Botany, Cairo University
Counselor, ASRT

U.S. JCC Members

Dr. Gilbert White (Chairman, U.S. Panel)
Institute of Behavioral Science
University of Colorado

Dr. George Bugliarello
President, Polytechnic Institute of New York

Mr. William A.W. Krebs
Arthur D. Little, Inc.

Dr. F. Karl Willenbrock
School of Engineering and Applied Science
Southern Methodist University

Egyptian Advisors

Dr. M.B.E. Fayez
Director, National Research Centre (NRC/Cairo)

Dr. Abdel Fatouh Abdel Latif
Vice President, ASRT

Dr. A.S. El Nockrashy
Director, International Secretariat, ASRT and
General Coordinator, Applied S&T Research Program

Dr. Osman Galal
Head, Child Health Laboratory, NRC/Cairo
Director, National Institute of Nutrition

Egyptian Principal Investigators and Program Monitors

Dr. Adel Abdel Azim, Director
Central Metallurgical Research and Development Institute
Principal Investigator, Bentonite Clay Project

Dr. Abdel Fattah Dawoud, Director
National Institue for Standards
Co-principal director, Standards & Measurements Project

Dr. Fouad Sobhy, Director
Organization for Standardization and Quality Control
Co-principal director, Standards and Measurements Project

Dr. M. El-Halwagi, Head
Pilot Plant Laboratory, NRC/Cairo
Principal Investigator, Biogas Technology Project

Economist Farouk Abdel Al
Head, Economics Section
Water Distribution and Irrigation Systems Research Institute
Ministry of Irrigation
Deputy Principal Investigator, Evaluation Project
for Irrigation Systems in New Lands

Eng. M. Shaltoot
Instrumentation Project Director, ASRT

Mr. Ahmed Abdel Baset
Information Systems Technology Project
Director, ASRT

Eng. Fouad Ragheb
Manager of Procurement
Instrumentation Technology Project

Dr. M.H. Fadl
Program Monitor, Science and Technology, ASRT

Dr. Zein Shoeb
Program Monitor, Science and Technology, ASRT

National Academy of Sciences (NAS/NRC)

Mr. John Hurley
Director
Board on Science and Technology for International Development (BOSTID)

Mr. Jay Davenport
Senior Staff Officer
Egypt Program, BOSTID

Agency for International Development/Cairo

Dr. Bernard Wilder
Associate Director
Human Resources Development Cooperation
USAID Mission/Cairo

Mr. Lawrence Ervin
Head, Science and Technology Division
USAID Mission/Cairo

Dr. Sherif Arif
Science and Technology Division
USAID Mission/Cairo

Dr. John Monagle
Science and Technology Division
USAID Mission/Cairo

National Bureau of Standards

Dr. Kurt Heinrich, Chief
Office of International Relations

Georgia Institute of Technology

Dr. Vladimir Slamecka
School of Information and Computer Science

University of Wisconsin (Madison)

Mr. Edward Falk
Instrumentation Systems Center

Attachment B

REVIEW AND ASSESSMENT OF THE PHASE II R&D MANAGEMENT PROJECT

Submitted to

ASRT/NRC R&D MANAGEMENT COMMITTEE

Prepared by

James P. Blackledge

Consultant

Cairo, Egypt

8 December 1985

TABLE OF CONTENTS

I. ACKNOWLEDGEMENTS

This assessment of the benefit and impact of R&D management activities on the operations of ASRT, NRC, CMRDI, and the Nutrition Institute was conducted in Cairo during the period 20 November--8 December 1985, at the request of the ASRT/NRC R&D Management Steering Committee and the U.S. National Academy of Sciences.

I wish to express my appreciation to Dr. Kamel, to Dr. Fayez, and to Dr. El-Nockrashy, who kindly explained to me the changes in ASRT/NRC since my last opportunity to visit Cairo in February 1983. Dr. Adel Abdel Azim and Dr. Osman Galal were similarly helpful in explaining changes in CMRDI and the Nutrition Institute.

I also wish to thank Dr. Ashour, Dr. El-Beltagy, Dr. Hatem Ali, Dr. El-Gouhary, Dr. El-Husseiny, Dr. El-Halwagy, Dr. Kasim, and Dr. El-Fouly, who took precious time away from their normal duties, to explain to me, in some detail, changes which have been taking place and the management principles that they are applying to impact on these changes. Their enthusiasm in undertaking their additional management tasks is clear evidence that R&D management practices are being institutionalized in Egypt.

I wish to express particular thanks and appreciation to Dr. Nabiel Saleh, who kindly arranged my schedule of appointments, provided logistical support and background information, and who gave me advice and counsel on matters which sometimes were not clear.

The observations, conclusions, and recommendations included in this report are based on my interpretation of information provided to me by the above and other persons. If I have misstated or misrepresented some of their opinions, the error is mine.

I would also like to comment that, within a short period of two weeks, it is virtually impossible to thoroughly assess all components of the ASRT and NRC management systems. Time simply has not permitted in-depth probing into these activities.

II. SCOPE OF THE ASSESSMENT

The Applied Science and Technology Program has had, as its ultimate goal, strengthening the role of Egyptian Science and Technology resources and directing these resources to impact on National Development priorities. The R&D Management Project, as a component of the Applied S&T Program, has emphasized training of senior ASRT/NRC personnel in principles of R&D management, institutionalization of training in management within Egyptian institutions, development of management systems in ASRT, its affiliated institutes and other R&D institutes, and the application of management practices to R&D projects.

This assessment is focused principally on changes, accomplishments, and problems which have occurred during the time-frame 1983-1985, although some references to activities during the period 1979-1982 have been deemed necessary. The analysis has included: personal performance; attitudinal change; institutional functions; organizational reform; impact of R&D management capabilities on project

planning and execution, marketing; linkages with end-users; experiences gained from utilization of R&D management practices; benefits which have derived from application of management principles; and proposed future direction for expanding and institutionalization of R&D management activities in Egypt.

III. COMMENTS ON R&D MANAGEMENT

First, I would like to comment that, after having had the opportunity to analyze the organization and management practices of over 80 research institutes in more than 40 developing countries during the past 20 years, it has become clear to me that effective R&D management systems are difficult to implement in such institutes. This is particularly true where: these institutes are constrained by civil service personnel policies; the major R&D funding must derive from Government entities; the productive sectors do not recognize the contributions which R&D institutes can make to solving their urgent problems.

It is not often that research institute staff have gained prior industrial experience which enables them to understand the need to solve problems of end-users and to undertake realistic R&D directed towards priority National Development goals. The Directors of the research institutes referenced above are unanimous in their opinion that these constraints severely curtail the ability of their institutes to achieve effective linkages with end-users. This aspect of R&D is not always recognized as an obligation of the professional research staff. There is little or no incentive to become involved in problem-solving related to extending the application of research results beyond the confines of the laboratory. The "career path" for professionals in many R&D Centres, similarly to university faculties, has been structured principally around the "publish or perish" modality, which dictates constraints as well as opportunities for professional advancement and promotion. In the absence of an appropriate career path, it is difficult to persuade professional researchers, protected by a civil service system, to engage in applied R&D.

1. Assumption of R&D Management Functions

It is relatively easy to provide training in R&D management. It is not always easy to institutionalize R&D management training in a developing country. It is difficult to gain competence in R&D management in the short term, and solely as a result of R&D management training, where the principles of management theory may have been absorbed, but where on-the-job experience is required to adopt and to adapt these principles to local conditions. Such experience is a time-dependent function, tempered by the realities of using management methodologies in a real world, constrained by the older existing system, the limitations imposed from the surrounding bureauacracy, needed attitudinal changes in R&D personnel, and above all, an understanding of how management can be an effective tool in enhancing organizational effectiveness. It is unrealistic to believe that people

become effective managers after one or two management courses and a few months of experience.

Obviously, senior and middle-level R&D management activities require the efforts of mature, experienced, professional researchers who have demonstrated leadership capabilities as well as scientific and technical expertise. Such persons are undoubtedly one of the most important human resources in the R&D Centre. They are already fully engaged in research. However, under the current existing "career path" constraints, it is unrealistic to assume that these experienced researchers will set aside their active involvement in R&D to become full-time R&D managers. The reasons are obvious. Their promotion opportunities become limited. They may be required to limit their involvement in external consulting activities, which generates financial rewards. They may lose their expertise in their discipline, with little or no assurance that such expertise can be regained, at a future date, if they elect to return to full-time R&D.

In a similar vein, it is unrealistic to expect R&D professionals to undertake full-time responsibilities in support service areas such as techno-economic analysis, marketing, technical extension/industrial liaison activities. Such persons must be qualified professionals who are experienced in the scientific and technical disciplines and who have been involved in applied R&D at least to the extent that they understand the problems and uncertainties of applied R&D. They should also posses some understanding, or have the ability to understand, the priorities and problem-solving requirements of the end-users.

2. R&D Management Functions in the NRC

I first became acquainted with the National Research Centre in 1971, and I have followed its progress closely since that time, with almost yearly opportunities to visit NRC and to observe changes in philosophy, management, and direction which have occurred during the past 15 years. The NRC has changed. Its management, in my view, has attempted, within the constraints imposed by the Egyptian system, to increase interaction with end-users and to achieve closer integration between R&D and National Development goals.

With initiation of the USAID/GOE "Applied Science and Technology Project" (1977), and the Egyptian "Five-Year Plan for Science and Technology" (1983), increasing attention has been focused on improving NRC's efforts to provide meaningful solutions to real problems of importance to National Development goals. NRC professional staff are being encouraged to become involved in applied R&D and to establish working relationships with the end-user community. It seems clear that NRC top management is dedicated to increasing such applied R&D and related interaction with the productive sectors.

At the same time, there is no clearly delineated parallel "career path" for researchers who engage in such applied activities. Discussions are currently in progress to resolve this issue, however until such time as a clear policy evolves, it is unrealisitc to expect a major involvement of the NRC professional staff in applied R&D, or in full-time R&D management, particularly where such involvement is

visualized as potentially damaging to the researcher's professional development and consideration for promotion.

In the case of ASRT and NRC, formal R&D management training commenced late in 1979. What has happened in the following six years? A Core Management Group exists. Senior researchers, trained in R&D management, are putting R&D management principles into practice, encouraging training of additional potential managers, and overseeing an evolutionary redirection of ASRT and NRC from a management point of view and in a positive way. One has only to look back at the operations of ASRT and NRC prior to 1977, to see the changes which have taken place. These can be highlighted as follows:

- High level appreciation of the importance of good management systems and a commitment to strengthen ASRT and NRC management in the short-term within the constraints imposed by the present environment;
- Commitment to broaden and strengthen management skills of NRC staff at all levels;
- Openness to experiment with new management methods and encourage suggestions from R&D staff;
- Striving for longer term solutions to problems imposed by constraints external to the immediate R&D institutions.

This is not to say that the management systems are fully adequate or indeed, even complete. The senior staff, however, are thinking about R&D Management principles, are using these principles in their daily activities, and are involved in the process of management improvement.

It is true that scheduled management goals may not have occurred in accordance with target dates. Nevertheless, these goals <u>are</u> being accomplished. Management is a judgemental process which involves people and their attitudes. Management achievements can best be measured in qualitative, rather than quantitative terms.

IV. CONCLUSIONS

1. Real progress has been made in improving R&D management practices, and in using management principles on a daily basis. Seven of the ten key positions in the new management system of the NRC have been filled by Egyptians who received specialized R&D management training in the U.S. The NRC Programming, Marketing, and Technical Offices are each using, on a part-time basis, 2-3 young researchers who have completed R&D management seminars in Egypt, and who have been identified as potential senior managers. The CMRDI and the Nutrition Institute, similarly, are directed by senior researchers with strong management experience.

2. Institutionalization of R&D management training has been successful to date. There is every reason to believe that such training will continue in ASRT and its affiliated institutes after completion of the Applied Science and Technology Project.

3. An excellent R&D management training concept has been devised which covers, during a three week seminar, all principles of R&D management. The seminar is based on the mechanism of home work assignments to solve real problems, case studies, group assignments to generate research ideas and prepare proposals. Identification of

potential NRC managers has been a side effect. This seminar, first presented in February 1985, is again scheduled for February 1986. The same format can be used in presentations to other R&D centres.

4. R&D management training is being extended to universities and research institutes external to ASRT, and to public sector enterprises and ministries, at the requent of these.

5. A major problem which confronts expansion of R&D management training and functional activities is that the Core Group (formerly ASRT/NRC Steering Committee), which has been carrying the burden of such activities, is assuming more and more management responsibilities. The need exists, and is recognized, to build a second tier of management experts who can take over some of the duties and obligations now undertaken by the Core Group of senior managers. A large reservoir of people trained in R&D management exists in ASRT/NRC. Steps must be taken to identify talented people who have been trained in management, who are interested in assuming management responsibilities and place them in an on-the-job training mode to gain the experience necessary to augment the functions of the Core R&D Management Group.

6. The schedule of R&D management training events and related activities agreed to in March 1982, has been essentially fulfilled, although target dates were usually missed. The ASRT/NRC Steering Committee (now called the Core Group) was established and is functioning. The NRC Program and Marketing Offices have been established, but need to be further strengthened. The R&D management library is functional although it requires additional documents. Seminars and workshops scheduled (externally and internally) have not only been completed, but additional seminars have been conducted. The only scheduled activity which has not taken place, related to external internships intended to provide practical opportunities for gaining on-the-job experience in five categories of R&D management. Some experience in these categories has been gained within the ASRT/NRC, but more is required.

7. The recent reorganization of the NRC management functions is essentially complete. Senior staff, who have received management training and who are experienced in management, have assumed responsibility, although on a part-time basis, for the operations of the new management offices, and are proceeding to design and plan their office functions from a practical management point of view.

8. It is doubtful that it will be possible to persuade highly qualified personnel to assume full-time management positions in these offices until such time as an appropriate "career path" is established which rewards researchers for other than publications in Peer Journals. While it may be possible to attract less qualified persons to accept full-time positions, it seems obvious that their performance might be less than adequate.

9. Management of administrative and support services are less than adequate at the present time. Both ASRT and NRC are attempting to improve these service functions, which are currently constrained by existing bureaucratic procedures. NRC is conducting training sessions for its support services personnel, particularly with emphasis on

accounting, control measures and other procedures required for NRC to increase its volume of contracted R&D with end-users. Considerable additional emphasis is required to improve these functions.

10. The More and Better Food Project, the Bio-Gas Project, and the Waste Water Management Project (not part of the Applied S&T Project) demonstrated the ability of NRC senior personnel to design, plan and execute large, multi-disciplinary multi-institute projects. However, the lessons learned from this experience show that the planners and project personnel did not fully recognize, during project design and implementation phases, the necessity for including economists, sociologists and communications experts, as part of the team. These disciplines must be included in large projects which can have a significant impact on societal considerations. This type of expertise is seen to be particularly important in projects which will be part of the framework for rural development.

11. Project evaluation and project control functions require strenthening, both for internally supported projects and for projects which are externally funded or are funded directly by end-users. The need for this is recognized by most senior management personnel who feel that they need additional assistance in this management area. A successful evaluation of the Nutrition Education Project by an all-Egyptian team has given management leaders confidence that they can do evaluations properly. The Nutrition Education evaluation has also demonstrated the importance of evaluation as a management tool.

12. The NRC Marketing and International Projects Offices are now planning their strategies to interact with end-users, with the objective to increase project support, both from Egyptian public and private productive sectors and from International funding entities. Their planning appears to be based on sound management principles, which include: communications and dissemination of information; establishment, of priority targets; matching NRC capabilities and experience with end-user's needs or requirements; and the requirement for frequent end-user contacts and follow-up. In-as-much as these functions are under the direction of two senior management experts, who are also active in R&D management training in ASRT and NRC, it is reasonable to assume that their efforts will be successful.

13. The need for a Management Information System is recognized as an important management tool at all levels within ASRT and its affiliated institutes. Several of the components for a MIS are already in place. The NRC Programming Office has programmed, into the computer, data on all NRC projects from 1980 to the present. These data include: title of project; project objectives; principal investigator; laboratories and NRC divisions or other institutes involved; number of staff involved; starting date; key words for access and cross-referencing (see Annex 3). Project financial budgets and expenditures are also in the computer. The Pilot Plant Laboratory has devised a report summary format which the Programming Office will include in the data base (see Annex 4). The CMRDI is using the same data information base and the Nutrition Institute will implement a similar procedure as soon as its computer is received. Clearly, the components for a Management Information System already exist. What is

needed now is to further refine these elements, expand the system to include other ASRT affiliated institutes, and to develop appropriate discriminators or "filters" in order to provide appropriate information to the several levels of management who need such data.

14. In 1984, a novel marketing concept, based on the successful experience of CMRDI, was initiated in the NRC. Industry-NRC R&D Committees were created in 12 industrial sectors. From these joint deliberations between NRC specialists and industry representatives, eight projects were agreed upon, and are being implemented. Two projects have been completed satisfactorily, and others are in the pipeline. This committee approach was temporarily suspended in 198[illegible] pending design and planning of the NRC Marketing Office. It is anticipated that such committees will be re-activated in 1986.

V. RECOMMENDATIONS

1. Additional technical assistance is required to assist the Marketing Office in formulating its management plan on a rational basis which will assure that the activities of the Marketing Office do, indeed, create effective linkages between NRC capabilities and end users. The functions of the Industrial Liaison Office of the Turkish National Research Council (TUBITAK) should be examined in the near future to provide possible guidelines to NRC in the use of this functional activity to strengthen its marketing effort. The Director of the Marketing Office should be provided an opportunity to meet with Vice Presidents--marketing, of organizations in the United States, such as Battelle Memorial Institute, Research Triangle Institute, Southwest Research Institute, Stanford Research Institute, to learn, at first-hand, how these large industrial research institutes provide marketing assistance to their Research Divisions. Further, it is recommended that the Director of the NRC Marketing Office devote a minimum of two weeks in the United States in consultation with a marketing expert, in order to refine and further develop the management plan which now is in preparation. A U.S. marketing expert should be prepared to come to Egypt, at an early date following the consultation, to assure that the management plan is being implemented. The full support and concurrence of the NRC Director and his Board of Directors should be assured prior to such additional assistance.

2. Additional technical assistance should be provided to assure that the practices of the Programming Office are sound, that the procedures are producing meaningful results, and to determine where improvements can be made in the system. An opportunity should be provided for the Director of the Programming Office to visit the United States to meet with several persons involved in project evaluation and controls, such as representatives of USAID, the National Science Foundation, NASA, the Naval Research Laboratory, the U.S. Department of Agriculture, and the Ford Foundation, to learn at first-hand the policies and procedures used by these organizations. Following these visits, he should spend a minimum of two weeks in the United States in consultation with an expert in project evaluation and controls, in order to further refine and strengthen the current management system and procedures of the NRC Programming Office.

3. The ASRT/NRC Core Management Group should provide leadership for the following:

- Expansion of training programs to serve new sectors;
- Encourage prepararion of case studies on subjects that strengthen the management role of the ASRT, NRC and other R&D centres at large, e.g.,
  - -- coordination of, and integration between, the National R&D institutes with related responsibilities and activities, irregardless of the sectors which these institutes serve,
  - -- development of management mechanisms for regional R&D laboratories;
- Develop analytical capabilities, within the management system, to integrate R&D activities and socioeconomic factors which are important to National Development goals.
- Devise methodologies for evaluation and feasibility studies of projects which have S&T components as well as socioeconomic components.

4. The ASRT/NRC Core Management Group should prepare recommendations for long range development of R&D management systems in the ASRT and NRC, addressing such issues as: training, including continuing training (in service) opportunities for persons who are already utilizing good management practices; institutionalization of management information systems; stengthening proposal and report preparation; strengthening and extending evaluation procedures; developing a more rewarding career path for R&D managers.

5. The Core Group should also assess the current management activities of researchers who have enrolled in R&D management training seminars in order to determine the effectiveness of R&D management training in Egypt and to prepare guidelines for design of future R&D management seminars.

6. The R&D Management Seminars and Training Workshops should not only be continued, but expanded to include personnel from other R&D Centres. Such seminars should be presented on a more frequent basis, with inputs from others who have received prior training but have not yet participated as a trainer. A "trainer" not only "trains", but also gains management experience. The objective should be to increase the number of persons available to conduct such training activities, as well as to broaden the experience of these trainers and encourage their involvement, to a greater extent in the management system.

7. A need exists to strengthen Administrative and Support Services functions. A "Procedures Manual" should be developed, which details the regulations to be followed, the requirements for information necessary for decision-making at different levels within the ASRT and its affiliated institutes, information required by project principal investigators to meet the commitments agreed to in proposals to end-users.

8. A Management Information System should be started, based on data already available in the NRC Programming Office, but expanded to include other data of importance for decision-making at various levels of management.

9. Study groups of 5-7 people, with interrelated interest in a specific technical area, should be selected to meet bi-weekly with the following objectives:

- use a multi-disciplinary team approach to generate new ideas in specific project areas which are deemed to be of interest to end-users;
- prepare proposals based on new ideas and attempt to persuade end-users to support the proposed projects financially;
- as an alternative; seek financial support from ASRT/NRC to fund viable projects to joint venture with end users;
- continuous evaluation of project(s) status and progress;
- case studies of completed projects to assess methodologies, success of project, transfer of R&D results to end-users;
- review and assess management principles involved.

10. The NRC-Industry R&D Committees should also be reestablished, with the guidance of the NRC Marketing Office, to pursue, more rigorously, opportunities for developing R&D projects jointly with end-users.

VI. R&D MANAGEMENT TRAINING, SEMINARS AND WORKSHOPS

1. Summary of activities - 1979 through 1982.

In 1979, the Denver Research Institute (DRI) conducted four workshops for 43 senior personnel of the Egyptian Academy of Scientific Research and Technology (ASRT) and the National Research Centre (NRC. The workshops concentrared on:

- R&D institute management;
- Marketing the output and services of R&D institutes;
  Techno-economic studies;
  Technology assessment.

A fifth workshop was conducted in Cairo in 1980 by four DRI staff members and three Egyptians who had participated in the Denver workshops. This workshop, "Management Aspects of Science and Technology," emphasized the basic management functions (planning, organization, control, and evaluation) as related to the requirements for direction of R&D organizations or projects. Eighty-Seven representatives from 20 scientific and technological organizations attended.

During 1980, 1981, and 1982, 13 senior staff of the NRC conducted a series of 11 R&D management workshops for 127 participants from 37 public and private sector organizations, including 25 researchers from the NRC. The workshops (and number of times each was presented) were as follows:

- Implementation of Policies for R&D (2)
- Projects Feasibility Study (3)
- Statistical Quality Control for Industrial Applications (from a marketing and problem identification viewpoint) (3)
- Technology Transfer and Evaluation (2)
- Marketing of Scientific Research Service (1)

In addition, four senior staff of ASRT/NRC attended the Battelle Seminar on R&D management in 1982.

2. Summary of Activities - 1983 to present

External Training/Seminars

Training Provided by	Seminar Title	Date Presented	Number Participants	Organizations
GWU	Contracts & Contract Negotiations	March 1983	3	NRC
MIT	Mgt. of Research Development, and Technology Based Innovation	June 1983	1	NRC
BMI	R&D Management	August 1983	3	ASRT/NRC
DRI	R&D Project Mgt.	Oct.-Nov.1983	2	ASRT
DRI	R&D Institute Mgt.	Nov.-Dec.1983	2	ASRT
DSE	Mgt. & Working Techniques for Project Leaders	December 1983	20	ASRT/NRC/ Others
	Training/Seminars in Egypt			
ASRT/GAOA	Mgt. of R&D Projects	May 1983	25	ASRT
ASRT/GAOA	Mgt. of Information Systems for Technology Transfer	May 1983	35	ASRT
NRC/GAOA	R&D Control & Performance	June 1983	35	ASRT
NRC/GAOA	General Mgt. for R&D Support Staff	June 1983	40	ASRT
DRI	R&D Project Mgt.	February 1984	29	ASRT/NRC/ Others
DRI	R&D Institute Mgt.	February 1984	16	ASRT/NRC Others
Dr. Ghamry	Analysis of NRC Operations	August 1984	89	NRC
NRC	Principles of R&D Management	August 1984	6	Atm.Eng. Inst.
NRC	Technology Transfer	November 1984	5	NRC
NRC	Principles of R&D Mgt., Case Studies	February 1985	70	ASRT

Training Provided by	Seminar Title	Date Presented	Number Participants	Organizations
NRC	Planning, Controls, Evaluation, Techno-Economic, Marketing, Procurement	February 1985	25	NRC
NRC	Principle of R&D Mgt., Case Studies	March 1985	70	ASRT
Total Persons Trained in R&D Management (1979-1985			736	
	Training/Seminars Scheduled in 1986			
NRC	Technology Transfer			NRC/Others
NRC	Planning, Controls, Evaluation Techno-Economics, Marketing, Procurement			NRC/Others
NRC	Feasibility Studies and Project Evaluation			NRC/Others

3. Compliance With Scheduled Training Goals

The schedule of training activities agreed to in March 1982 has been essentially fulfilled (see No. 2 above) although target dates were usually missed. Seminars and workshops were not only completed, but three additional seminars were conducted. Four case studies were presented as seminars (Biogas, More & better Foods, Marketing, Programming). Arrangements for eight internerships, in the areas of: Marketing, Techno-economics; Contracting, Procurement; Planning Evaluation; Monitoring; Industrial Liaison; which were intended to provide practical opportunities for gaining on-the-job experience, were not completed. Some experience in these categories has been gained within the NRC, but more experience is required.

4. Assessment of R&D Management Training Activities

According to data provided on training activities for the period 1979-1985, 736 people from ASRT and its affiliated institutes, universities, other research centers, and the productive sectors, have been exposed to the principles of R&D Management. This does not mean that 736 experienced R&D managers have been created as a result of this training activity, since time and practical on-the-job experience are required to produce a competent R&D Manager.

Further, only a relatively small number of those trained are involved in management, other than at the project level. Project level management is, of course, essential, particularly as researchers become more and more involved with practical-problem solving, and with the

needs of end-users. But, at the present time, the burden of middle -and top- level management appears to be carried by a relatively small number of persons, who also conduct the training workshops and seminars in addition to their research activities. This core group needs to be expanded and strengthened to further extend R&D management training activities and to provide additional depth at the middle and top level management functions.

It appears that institutionalization of R&D management training in Egypt is taking place effectively, and that it will continue. The Egyptian professionals, who are conducting the training seminars, have developed an innovative three week seminar for NRC staff. This seminar was first presented in February 1985 and is again scheduled for February 1986. The seminar is based on integration of lessons learned and experiences gained from attendance at workshops in the United States and from the Egyptian seminars which have been presented.

The seminar is presented in a logical framework, starting with policies and objectives of the NRC, then proceeding with management by objectives (MOB); relationships between NRC, National, and personal objectives; project planning and controls; staffing, human resource development, training and motivation; marketing; techno-economic feasibility studies; administrative and support services functions. Throughout the seminar, participants are assigned home work problems, based on real situations that have developed in the NRC. During the final week, participants are divided into four small groups. Each group is charged with the responsibility to identify a technical idea, prepare a proposal, based on management principles learned, and to present the proposal for review by the seminar lecturers at the end of the week.

During the February 1985 seminar, assessment of the seminar achievements showed that:

- four proposals were prepared which were ready to be submitted to NRC or end-users for support;
- researchers can cooperate in the preparation of proposals;
- the results of this exercise identified potential middle-level managers.

A seminar of this nature, designed and executed by Egyptians is seen as an excellent example of how prior experience gained is being focused on R&D management training in Egypt. It is to be hoped that, with time, this type of seminar can be presented to other research centres.

The NRC Training Office is also conducting training programs for administrative and support services offices. This activity is fairly new, and is based on recognition that NRC adminstrative and support services need to change also to accomodate the increasing emphasis of NRC on conduct of applied R&D and more effective linkages with end-users.

VII. R&D MANAGEMENT IN ASRT

It must be remembered that ASRT is a relatively new entity (1972) and that its organizational structure has evolved, over the past 13 years, in an era when R&D management expertise was not prevalent in Egypt. With the advent of the "Applied S&T Project" (1977) and the Egyptian "Five Year Plan for Science and Technology" (1983), the ASRT was thrust into the necessity for providing R&D management functions, including administration and support services, on a much larger scale, to a number of multi-institutional, multi- disciplinary projects, as well as to individual projects. These management functions require an oversight of basic as well as applied R&D. Thus, ASRT has been faced with the dual problem of involvement in the daily management of projects and programs, as well as with the need to obtain management training and practical management experience at senior and middle management levels, while at the same time it is involved in redesigning its organizational structure to cope with the new emphasis on Applied R&D and relationships with end-users.

The ASRT President, Dr. Kamel, holds the opinion that, within the constraints as defined above, technical aspects of management of the Five Year S&T Plan projects has proceeded reasonably well, although much has yet to be learned, and procedures must be improved. The ASRT Specialized Councils are using R&D management principles to manage projects within the Five Year S&T Plan. These include advertising for proposals, preparing RFP's, serving as referees in project selection. Monitoring and evaluation capabilities are still not strong, but are improving.

However, Dr. Kamel is preoccupied with the apparent inability of ASRT staff members to adequately perform administration and support services functions in a satisfactory manner. Such functions are dictated largely by the hierarchial procedures of the Egyptian Government, and are not often amenable to change within ASRT. There is a recognized need to change these procedures to permit ASRT to function in a more flexible and effective way. However, until this is achieved, ASRT is obligated to function within the constraints of an inappropriate system. It appears that the Egyptian Government is aware of these constraints, but, to date, it is uncertain as to when change will take place.

It seems ironic, indeed, that ASRT has been able to grant expanded autonomy to its institutes such as NRC, CMRDI, and others, which permits these institutes to function much more effectively than is possible for ASRT.

VIII. R&D MANAGEMENT IN NRC

During 1985, NRC management has been involved in definition and redirection of its functional activities and establishment of a new management system. While some changes are still needed, these are recognized and emphasis is being placed on making these changes. The Programing Office, the Central Services Office, the Training Centre, and The Technical Office are operational. Planning for the Marketing

Office and the Foreign Contracts Office is underway. A decree is under consideration which will establish an International Relations Office. See Annex No. 1, NRC Management Organization Chart.

In the sections which follow, the appropriate NRC decrees are presented, along with descriptions of some of the management functional activities for this new management system. No attempt has been made here to assess the effectiveness of these offices, since they are so new. It seems fair to state, however, that planning for, and operation of these offices appears to be based on sound management principles. Only time will determine how effective these offices become.

1. Decrees Establishing the NRC Management System

Decree No. 121, 13 August 1985

a. Establishment of "Technical Matters Policy Committee". To be headed by Director of NRC, and rapporteur Dr. Mahmoud Sidky.
b. Responsibilities: Policies of: Scientific relations; central service laboratories and facilities.
c. The following persons will assist Dr. M.Sidky in the responsibilities following each name:

1. Dr. M. A. Kasem
   Overall supervision of the following labs:
   - Central Service Lab.
   - Material Testing Lab.
   - Biological Fluids Lab.
   - Animal House.
   - Repair and Maintenance Unit.
2. Dr. F. Osman
   - Lab. and Department Councils.
   - Administration of overseas exchange of personnel from NRC.
   - Administration of bilateral agreements. (experts and visiting scientists).
3. Dr. H. I. Nasr
   - Safety and Security.
   - Engineering Dept. (Carpenter, Electricity etc.)
   - Overall building safety.

Decree No. 122, 13 August 1985

a. Establishment of "Research Projects Policy Committee". To be headed by Director of NRC, and rapporteur Dr. H. S. Abdel-Rahman.
b. Responsibilities: General overall research activities; Research priorities to fit in with the National Plan.
c. The following persons will assist Dr. H. S. Abdel-Rahman in the responsibilities following each name:

4. Dr. M. El-Houseiny:
   - Assist in planning internal research projects.
   - Prepare assignments in form of research projects to fit the National Plan.
   - Supervise and monitor internal research projects.

- Annual report of internal research projects.

5. Dr. A. H. Rifai
   - Assist in monitoring and evaluation of research activities through contracts with ASRT, universities, research institutes, production sectors and private sectors.
   - Assist in maximizing results of research contracts.
   - Annual report of research contracts.
6. Dr. M. El-Halwagy
   - Assist in marketing activities and techno-economic studies related to research projects.
   - Contract national organizations to disseminate NRC serv:ces.

d. Establish an Office named "Management and Monitoring of Research Projects". To be headed by Dr. H. S. Abdel Rahman. Duties include:
   - Contracting procedures.
   - Management of financial aspects of projects.
   - Local purchase of equipment, chemicals etc.
   - Supervise per diems, travel expenses and incentives of all contacts.
   - Receive all periodic and annual reports.

Decree No. 134, 22 August 1985

Appointment of Dr. M. El-Fouly to supervise Foreign Contracting Office affiliated to the Research Projects under Dr. H. S. Abdel-Rahman.

Decree No. 52, 12 May 1985

Technical Office:

To be headed by Dr. Nabiel A. M. Saleh. Assistants: Dr. S. E. El-Negoumy and Dr. Azza Fahim.

Responsibilities

- Overall supervision of Director's Office in all administrative and technical matters.
- Establish a library with all relevant reports and basic data in general area of R&D management.
- Carry out studies on technical matters referred by Director of NRC. Prepare annual report for all NRC activities.

Decree No. (In Process)

International Relations Office

Expected Resposibilities:

- General marketing in international field for NRC activities.
- Marketing is expected to be with international agencies active in R&D, with the aim of acquiring research projects, training of NRC personnel overseas, bilateral agreements and other international activities.

- Activities are expected to be followed up through other NRC bodies, e.g. Scientific Relations, Foreign Contracting, Marketing and Training Centre.

2. R&D Management Functions of the NRC Programming Office

In 1976, the NRC began to emphasize multi-disciplinary, multi-institute projects in five areas of competence in NRC: Health; Agriculture and Foods; Energy; Environment; and Transfer of Technology. The NRC Programming Office was established after several senior researchers attended R&D Management Training Seminars in West Germany and in the United Kingdom.

An effort was initiated, at this time, to assist researchers in methodologies for requesting project funds from the NRC, along with guidance on preparation of proposals. The programming Office initiated procedures for assessment of proposals in terms of compliance with the objectives of the multi-disciplinary NRC areas listed above. The Programming Office suggested topics of priority, attempted to improve project R&D and management, and conducted evaluation of the projects to the extent possible.

It was learned, however, that the researchers still tended to work in isolation and were reluctant to discuss their research with others. Proposals often were not well-defined, and scheduling of project activities frequently were missing. Although it was believed that adoption of a project management system was premature at this time, bar-chart scheduling was introduced and the proposal format was modified in order to standardize proposals for future analysis and approval/rejection procedures. See Annex 2.

In 1982, current project information was put into the NRC Computer to provide a management overview of research in progress. These data include: title of project; principal investigator; laboratories and NRC divisions involved; summary of project; objectives; number of staff involved; starting date; key words for access and cross-referencing. All current NRC projects (from 1980) are in the computer. See Annex 3 for a typical project summary. At some future date, the system will include report summaries, and information on transfer of results to end-users. See Annex 4. At the present time financial information is available in the computer data base but not included on the project's printouts, although these data will be included as more and more NRC projects receive external funding support.

In 1984, a new system for evaluating projects was initiated in the NRC, as follows:

- Specialists present ideas on topics for possible new research, e.g., insecticide residues;
- The Programming Office requests opinions on the topic. In the case of insecticide residues, the requests for opinions might be referred to experts in pesticides, food technology, environment, plant physiology/histology, etc;
- The Programming Office convenes a seminar to further discuss the ideas and opinions, and to develop the approach necessary to solve the problem. Subsequently, a multi-disciplinary proposal is prepared by the potential project participants and submitted for review and evaluation.

- Participants in the project, depending on the nature of the research and talents required, may come from universities or other research institutes.

The procedure used for proposal review and evaluation is the following:

- All proposals are referred to an NRC committee for review;
- The proposals are also submitted for peer review by experts external to the NRC;
- An evaluation sheet and opinions of reviewers are forwarded to the author of the proposal. The author of the proposal is required to respond to the evaluation and to modify his proposal to satisfy the conditions imposed in the evaluation. Even if the proposal is rejected, the proposal author receives the evaluation so that he understands the reasons for rejection.

A similar procedure is followed for review of project reports at six month intervals. The principal investigator is required to respond to report reviewer's comments in his next report.

The NRC Accounting Office works closely with the Programming Office to develop expenditures for each individual project and for NRC totally. The Programming Office determines the project budgets in cooperation with the principal investigator. The Accounting Office monitors expenditures as a function of time and effort. Printouts from the computer are received by each principal investigator to enable him to control the project, to modify or redirect his research, or to ask for an extension of time or funding.

At the present time, 100% of NRC projects are subjected to the proposal procedures and monitoring system described above. At first, NRC principal investigators were unhappy with what they regarded as intrusion into their research, but a distinct attitudinal change has been observed, as principal investigaters have realized that the system helps rather than hinders them.

During 1985, the Programming Office has concentrated on expanding its staff and upgrading staff capabilities to increase the efficiency of the office. Additional management training has been provided through NRC seminars and workshops, however the need exists for external training opportunities. The Programming Office is staffed on a part-time basis only, at the management level, because of the incentive constraints which impede full-time management involvement throughout NRC.

During 1986, the Programming Office will concentrate on increased involvement of end-users in all phases of the project monitoring process, including idea evaluation, proposal preparation, report review. The Programming Office is attempting to get industry personnel involved in research projects under the supervision of NRC principal investigators. The objectives are to: permit industry people to obtain an advanced degree; to understand the methodologies of applied R&D; and to gain an insight into the capabilities of the NRC in industrial problem solving. These industry people may be assigned to either new or on-going projects of interest to a particular NRC principal investigator or the industry person may be able to bring a

research project idea and work on the problem in NRC. Obviously, if successful, this approach provides an excellent opportunity to forge linkages with end-users. Further, these young people of today may well become the industry leaders of the future. This activity can be considered to be a component of the marketing function which NRC is attempting to establish.

The Programming Office feels the need to increase its project analysis activities, to include assessment, evaluation, techno-economic analysis of value to end-users. While these functions are most important as NRC expands its efforts in applied R&D and interaction with end-users, a major increase in such project analysis activities will probably not occur in the absence of full-time R&D management staff.

3. Management Functions of the NRC Central Services Office

Dr. M. Kasem has been appointed Director, Central Services Office. His objective is to coordinate integration of technical services between Service laboratories, assess their performance, outputs, services to NRC projects and to outside users, determine income from services provided, and promote additional use of the Central Service Laboratories both inside NRC and to external users.

Dr. Kasem's analysis, to date has shown that:

- 35% of the Central Service Laboratories activities are for work outside of the NRC to small private industries, universities and other institutes;
- 65% of these laboratory's income is from services provided to small industries, universities, and other research institutes;
- 30 NRC projects (25% of total projects) were provided technical services in November 1985;
- 20 laboratories (40% of total laboratories) were provided technical services in November 1985;
- 25% of the income for services was provided in the area of equipment repair and maintenance (principally electronics) for NRC and for external clients;
- 55% of the equipment in use was provided by USAID.

A study group of Service Laboratory Heads has been established by Dr. Kasem to undertake a planning process to develop better integration between service laboratories, with NRC research laboratories and outside clients, to increase efficiency, and provide additional services. From this planning, he also expects to establish policy objectives for the Central Services Office. He also expects that such planning will make an attitudinal change in service laboratory staff regarding improved performance of services for NRC laboratories and external users and reduce or eliminate bottlenecks that have impeded such services. A feed-back mechanism is being implemented between laboratory managers to learn why or why not services are being provided.

At the present time, brochures are being prepared, for distribution to industries, which will advertise capabilities, facilities, experience that is available in analysis and testing, quality control,

standards, instrument repair and maintenance, etc. These brochures will be prepared to emphasize particular services for specific industrial sectors.

4. Planning Operations of the Marketing Office.

The objectives of the NRC Marketing Office are to:

- provide assistance to NRC laboratories and departments in marketing activities and techno-economic studies related to on-going and future research projects;
- Establish contacts with national organizations and the productive sectors to disseminate information about NRC capabilities and facilities.

Dr. El-Halwagy has prepared a plan for the Marketing Office which is under consideration by NRC management at the present time. The plan includes the following:

- establish a nucleus of 2-3 people to assist in marketing activities; appoint an advisory committee of 8-10 people from NRC representing several departments and disciplines;
- renew and strengthen the NRC-Industry R&D Committees;
- conduct a self-evaluation of NRC to determine actual saleable capabilities;
- open channels of communication with the Minister of Planning, other Egyptian Planning entities, and other Ministries;
- identify potential customers and the services that these need;
- identify competitors (universities and other R&D centres) and learn what they do;
- prepare brochures for each NRC department, which portrays that departments experience, previous accomplishments, human resources, capabilities, facilities, and services available to end-users;
- initiate a monthly newsletter, entitled "Science in Service to the Community" which will be, in effect, the bulletin of the NRC Marketing Office, and which will include contemporary information on NRC R&D, new technologies, and an information answering service;
- schedule industry seminars every three months in specialized topics such as pulp and paper, textiles, etc.

Dr. El-Halwagy's goal is to devise a strategy whereby the NRC can increase its market share and open new markets. He is hopeful that this can be accomplished by: use of self-evaluation for internal improvement to strengthen weak areas, develop new R&D services, and upgrade capabilities; providing consultancy services, e.g., techno-economic feasibility studies to meet client's needs; and opening new markets for NRC research results which are "on the shelf" but not now being used.

5. R&D Management Approach Used in the Waste Water Treatment Project

The objective of the project is to design and demonstrate simple water treatment processes, which can be operated and maintained under

local conditions. This has been completed successfully for one village. The second phase of the project will implement the lessons learned in design and installation of a waste water treatment facility for the district Katamia, a new city with an eventual propulation of 25,000 people.

The first phase of the project involved participation from several disciplines - civil/sanitary engineers (Universities), municipal sanitary engineers (Cairo), micro-biologists, organic and inorganic chemists, analytical chemists (NRC).

The management approach to design, planning, and execution of the project was based on frequent personal communications between the participants, and involved the following:

- Joint definition of the project objectives and goals and development of the project proposal outline;
- After the proposal outline was established, participants in each discipline prepared the appropriate sections of the proposal. These were discussed from the point of view of compliance with goals and objectives, technical feasibility, required inputs, working plan, coordination, etc.;
- Frequent meetings of participants (weekly) served as a forum to identify problems as well as accomplishments and to make necessary decisions regarding these.

The interim and final reports were prepared using the same procedure, with each participant responsible for his/her section of the report, but with overview responsibilities for other sections, and the report in its totality.

The management function of the project coordinator (Dr. F. El-Gouhary) included not only technical inputs, but also coordination of the several project activities, assuring appropriate linkages between the activities, and using a team approach to solving problems confronted during the project.

On the question of how the project would now be planned and implemented, based on lessons learned and experience gained, Dr. El-Gouhary stated that it would be most important to include techno-economic analysis and socio-economic analysis, since it was learned that these are most important aspects to assure the success of the project. Techno-economic analyses are important to evaluate foreign water treatment technologies offered to the Egyptian Government, in order to determine if they really are appropriate to Egyptian conditions. Also, consideration must be given to simplicity of maintenance and costs of operation.

Socio-economic analysis are equally important to consider the impact of such treatment systems on improving the quality of life of the people.

6. R&D Management Approach in the More and Better Foods Project

No attempt has been made to summarize the management approach for MBF here, since this is in preparation as part of the end-of-project report for the More and Better Foods Project.

7. R&D Management Approach in the Bio-Gas Project

The overall objective of the project was to demonstrate that the application of biogas village-scale technology is technically, socially and economically feasible in rural areas of Egypt. Major considerations included contributions of the biogas technology environment relating to supplies of energy and fertilizer, as well as to waste treatment, public health control and sanitation.

Planning for the project proposal was conducted by a six member multi-disciplinary team, including scientists, engineers, and a rural sociologist. The same team members were involved in implementation and management of the the project to completion, and in appraisal of satisfactory compliance with project goals, objectives and results (See Annex 5).

The team, during the planning process, established the project goals as follows:

- To conduct viable, creative and relatively successful demonstration programs;
- To assess biogas technology as a means of pollution control, waste recycling and upgrading soil fertility;
- To prepare, on a sound basis, concrete and practical recommendations on how to foster the implementation of biogas technology on the national level.

The team, as part of its work plan, prepared a milestone chart, which depicted major components of the project, target dates for completion of tasks, staff assignments and responsibilities. This chart was updated and used, during biweekly meetings of all project leaders and their key personnel, in order to assess project status and results, project areas which required additional emphasis, changes or modifications in project direction or project objectives. At six-month intervals, a detailed plan of work for the next six months was prepared.

It appears that this management approach, was successful in guiding the Bio-Gas Project from inception to completion, and a case study on the management approach is being used in the R&D Management seminars presented to the NRC.

IX. R&D MANAGEMENT APPROACH IN THE CMRDI

The Central Metallurgical Research and Development Institute (CMRDI) was established in 1972, with assistance from UNDP, as a laboratory of the NRC. In 1983, CMRDI was separated from NRC, and became an autonomous institute of the ASRT, with its own facilities and laboratories in El-Tebbin. Strong working relationships with NRC, however, continue to exist.

CMRDI is totally dedicated to applied R&D and technical services to industry. Its four functional activities are: supporting services to industry, such as information, analysis and testing, quality control, techno- economic evaluation; extension services, including improving plant productivity through process change, improving product quality, trouble-shooting, consultancy services; research and development oriented to product development, process improvement, materials utilization; and training of industry personnel aimed at either improving the existing technological level of Egypt's industrial

sectors, use of R&D results, or introducing (i.e., transferring) new technology. Little, if any, basic research is undertaken.

The management philosophy of CMRDI, since its inception, has been developed by Dr. A. Abdel Azim, who has been one of the principal leaders in instigating R&D management practices in NRC and ASRT, and has been active in the conduct of R&D management training seminars, in planning strategies for implementing R&D management activities, and in counselling his own, ASRT and NRC staff members on effective management practices.

CMRDI has expanded its contract R&D volume from a few thousand Egyptian pounds initially to a total of 2 million Egyptian pounds by the end of 1985. These contracts have been with ASRT, other Ministries, and with several industrial sectors. At the beginning, more than 90% of these contracts were negotiated through the initiative of Dr. Abdel Azim, who established Industry-CMRDI committees to jointly define problem areas and the solutions to these, and through his personal relationships with industry top management.

Now, the CMRDI senior staff are increasingly assuming the tasks of generating new ideas, developing project proposals, managing the research projects, and making industry contacts. A team approach is used, where staff with expertise required to solve a problem work together, both for project definition and for project implementation. Dr. Abdel Azim now serves in a policy advisory and project review capacity. His researchers know that they can ask him for promotional assistance if required and for his opinions about technical aspects of their research, but, they are enthusiastic about the opportunity to perform management as well as research functions with a minimum of supervision. This may well explain why the contract research and technical service activities at CMRDI are successful.

Reports for ASRT projects are reviewed by committees formed from one of the Specialized Councils. For contracts with the productive sectors, however, other than CMRDI internal reviews to assure compliance with project goals and satisfactory research results, reports are not reviewed. Continuous, close contact is maintained throughout the life of the project with the clients, along with client follow-up. Project evaluation consists of determining whether: the client is using the technology or know-how; if the client is applying the results in his industry; if the client is satisfied with the results provided by CMRDI. Clearly, this represents evaluation by the end-users, particularly when it can be shown that many CMRDI clients are "repeat-customers".

The CMRDI Administrative and Support Services provide the Director and his Senior Managers with a monthly report and fiscal analysis of Institute and project financial expenditures. These include salaries, supplies and materials; purchases of equipment; construction and maintenance costs. Notably, and most important, monthly staff time inputs into each project are tabulated. CMRDI experts to receive its own computer soon; these data will then be computerized as part of the management data base.

In a similar manner, the CMRDI Programming Office reviews the

status and performance compliance for each project, updates bar charts used to plot "milestones", and summarizes the data for use by the Director and his senior management team. These data will also be incorporated into the computer at an early date.

X. MANAGEMENT APPROACH TO REORIENTATION OF NUTRITION INSTITUTE

This description of management functions used to redirect the activities of the Nutrition Institute is included here because, even though it is not an ASRT - affiliated Institute, the leadership in its redirection was provided by Dr. Osman Galal, who has been involved in R&D management activities in NRC and ASRT since 1976. Further, the approach used may be of some assistance to other institutes or laboratories who are confronted with a similar problem.

When he was appointed Director of the Nutrition Institute in 1982, Dr. Galal began an immediate assessment of the operational characteristics of the Institute. The approximately 130 researchers were involved in individual research of their own choosing, with little or no interaction among researchers and with practically no relevance to national priority development goals. Nutrition Institute researchers had never been involved in methodologies of R&D management. They felt the need for management but believed they were constrained by lack of an R&D management function within the Egyptian System. The library had been closed for 10 years. The lift was not in working condition. The annual support budget for other than salaries was sub-marginal (15,000 LE). There were minimal contacts between the Nutrition Institute and the Ministry of Health, so that MOH had very little knowledge of the nature of research projects or of the potential for these projects to impact on National nutritional problems.

The primary task undertaken by Dr. Galal was to determine how to reorient the Institute activities so as to be involved in the National Development Plan and to establish Institute priority objectives and a work plan. During discussions with the Minister of Health, he determined that a priority target area was to improve the productivity of the people through improved nutrition, which, in turn, would impact on National Development.

Dr. Galal and his staff analyzed the MOH five-year plan, which included therapeutic capabilities of hospitals, improvements in preventative medicine, primary health care systems, improvements in emergency medical services, family planning from a medical point of view. As the result of a number of planning and "brainstorming" sessions, agreement was reached that the Nutrition Institute could make positive imputs into preventative medicine, primary health care, and family planning from a medical point of view.

The Nutrition Institute team also examined the plans of the Ministry of Agriculture and the Ministry of Supply, who are responsible for food production and food imports to learn about possible areas in these where the Nutrition Institute could interact. Their approach involved establishment of a network between the Nutrition Institute, the Ministries of Health, Agriculture, and the Ministry of Supply to exghange information and to be prepared to solve critical problems.

A series of staff planning sessions analyzed previous data available, especially the data of the National Nutrition Status Survey (1978) and the Food Consumption Pattern Survey (1980). This analysis led to the identification of priority activities to influence increases in human productivity through better nutrition. It was decided, for example that children, infants, and pregnant mothers should be the first priority, since it really was not possible to influence, in a major way, the productivity of the present working population. The strategy of the Institute was also directed to combatting iron deficiency anemia, effects of energy intake on growth to combat malnutrition; nutrition education, preparation of Egyptian food composition tables; training and upgrading capabilities in Nutrition Science.

During the past three years, the Nutrition Institute has obtained funding for six projects which are focused on the above priorities. The annual support budget has been increased to 60,000 LE. Collaboration has been achieved with the NRC, several universities and other institutes which provides the following opportunities: to learn what others are doing in the field of nutrition science; to provide incentive opportunities to staff from universities and other institutes, to help these develop their capabilities in nutrition science; to obtain services needed by the Nutrition Institute.

The Nutrition Institute is attempting to create linkages between agriculture and health through, as an example, evaluations of Nutrition Education Programs and More and Beter Food project. The Nutrition Education evaluation has been completed. The MBF analysis is nearly finished. These evaluations will become part of the framework for effective rural development.

The future planning of the Nutrition Institute is being directed towards:

- creating understanding by nutrition scientists of societal needs;
- uprading analytical and evaluation capabilities;
- increased staff interaction on multidisciplinary problems;
- improved interaction with universities and other institutes;
- strengthening contact with Ministries and productive sectors.

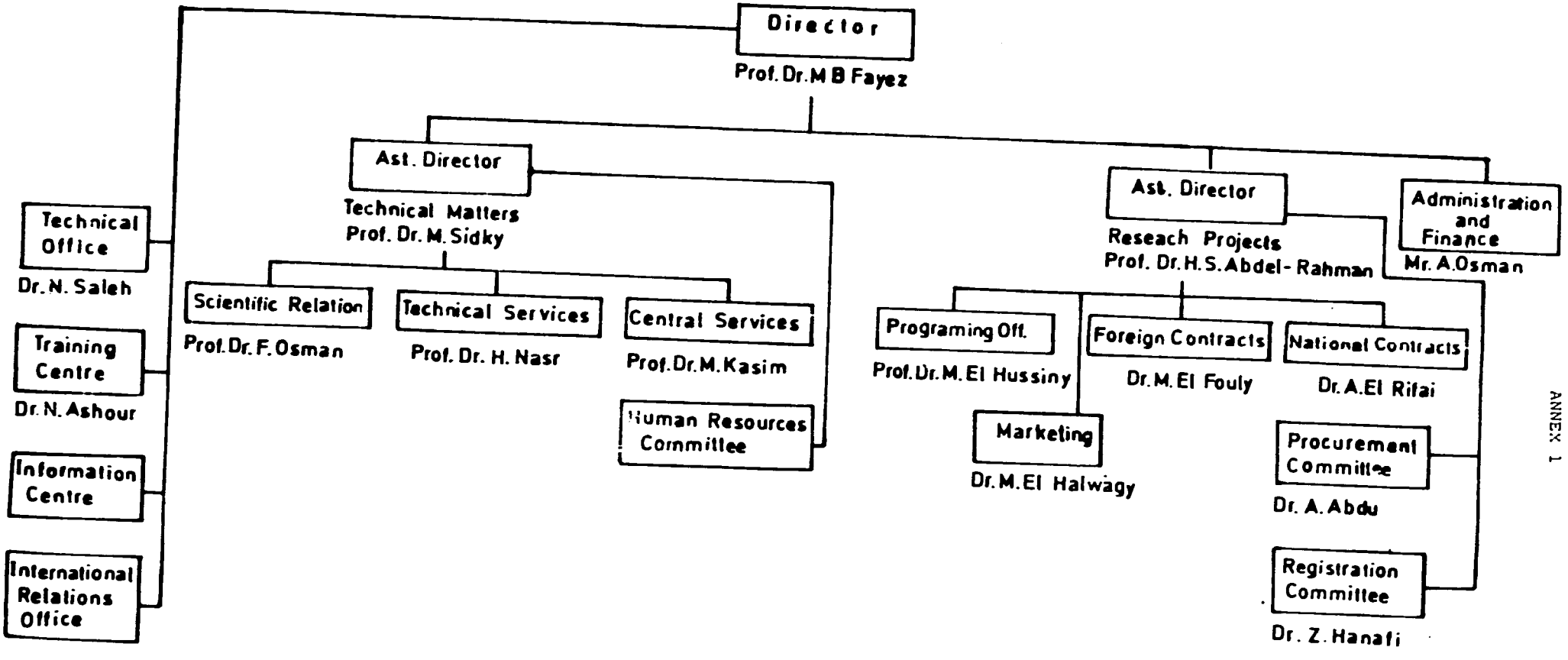
For the present, the decision to establish a full-time R&D Management Office has been deferred; instead, emphasis is being phased on frequent staff "brainstorming" sessions, using capabilities and available data to solve specific problems.

XI. ANNEXES

NATIONAL RESEARCH CENTRE

Organizational System

November 1985



ANNEX 1

ANNEX 2

Unified Format for Ongoing
Research Projects

Title:
Code No: Other Nos.:
Specialisation: Key-Words:
Objective:
Approval Date: Project Duration: Extension:
Principal Investigator: Address and Telephone:
Co-Investigators:
Total No. of Project Team Members: Man-Months:
Project Performed at:

Sources of Funding:

Total Funding: L.E. $

Targets:

	First Year	Second Year	Third Year
1. p			
a			
2. p			
a			
3. p			
a			
4. p			
a			
5. p			
a			
6.Dates of Reports p			
a			

P: planned,& accomplished

Follow-up/Reports

Serial	Period	Report Date Preset	Report Date Actual	Rating	Expenditures to-Date L.E. Equipment	Others	Incentives	Total

Final Evaluation:

Were objectives achieved? Yes No

Are results applicable?

Where? What are users views?

How to follow up implementation?

Remarks:

ANNEX - 3
Typical Project Summary
NRC Programming Office

Code No. 1/4/1/81

Project Title: Microbial toxins in foods and dairy products

Objectives: 1- Survaying the presence of toxins from gram positive staphylococci in milk and dairy products.

2- Presence of aflatoxins in dairy products and effect of processing on their presence.

3- Fungal toxins in foods.

Principle Investogator: Prof. Kh. Naguib

Laboratories involved: Laboratory of Food Technology & Dairying.

Personnel:	A	B	C
	1	1	11

Starting date: January 1980

Code No1/4/2/81

Project Title: Attempts for the production of early nitrogen fixing cotton, wheat and corn cultivators through tissue culture and genetic engineering techniques.

Objectives: The production of short life, nitrogen fixing cultivator using modern technologies in genetics and plant breeding

Principle Investigator: Prof. A.M. Ali

Laboratories involved: Genetics and cytology laboratory.

Personnel:	A	B	C
	2	5	1

Starting date: July 1981

National Research Centre
Pilot Plant Laboratory

ANNEX 4: Typical Report Summary
Technical Report No: PPL/ 1 / 1984
Report Date: February 1984
Project Staring Date: July 82 Duration: 18 month

REPORT HIGHLIGHTS

TITLE OF REPORT: Production of Zinc Sulphate from Zinc wastes.

NATURE OF STUDY: ☐ Lab. Experiments ☒ Bench Scale ☐ Pilot Plant
☒ Technical Study ☐ Market Study ☒ Feasibility
: ☐ Other (Specify:

KEY WORDS : Zinc sulphate-Zinc wastes-bench scale-process development economic assessment

OBJECTIVE OF WORK:

To assess the prospects of developing a commercial process for the production of crystalline Zinc sulphate from local Zinc wastes to substitute import needed for local agricultural, medicinal and laboratory uses.

SCOPE OF THE STUDY:

1- Survey of locally available effluent zinc wastes and determination of their quality.

2- Preliminary market survey of prospective zinc sulphate product.

3- Development of an appropriate process for bench-scale and experimental determination of optimum operating conditions. Key parameters include temperature, concentration and time.

4- Prefeasibility study on the basis of preliminary process design and order-of- magnitude level economic evaluation.

FINDINGS AND CONCLUSIONS:

1- Both commercial and pure grades can be produced from effluent zinc wastes. Process essentially involves treatment of wastes with 20% H_2SO_4 for 150 mins. at 50 °C. Soluble Zn SO_4 is first formed then the crystalline product may be produced by filtering off insolubles, purifying and concentrating the solution to adjusted limits.

2- Agriculture requirements amount to about 900 T/yr at 350 LE/ton while medicinal and laboratory requirements of 8 T/yr at 800 LE/ton. Thus an 1000T/yr production unit may be established within an existing plant, preferably producing H_2SO_4.

3- Preliminary evaluation shows that a production unit based on proposed processes for commercial or pure grades is economically feasible.

RECOMMENDATIONS:

1- Subsequent stages required to develop a technology package should be undertaken. These include experiments on pilot scale to furnish engineering data, detailed engineering and full-fledged feasibility study.

2- Efforts should be directed towards finding an end-user that would adopt the idea and participate in the developmental stages.

ADVANTAGES:

1- Employing existing integrated research, development and engineering capababilities to develop 'own technology'.

2- Ulilisation of Zn wastes to produce a material that is currently totally imported.

LIMITATIONS:

1- Irregularity of Zinc wastes.

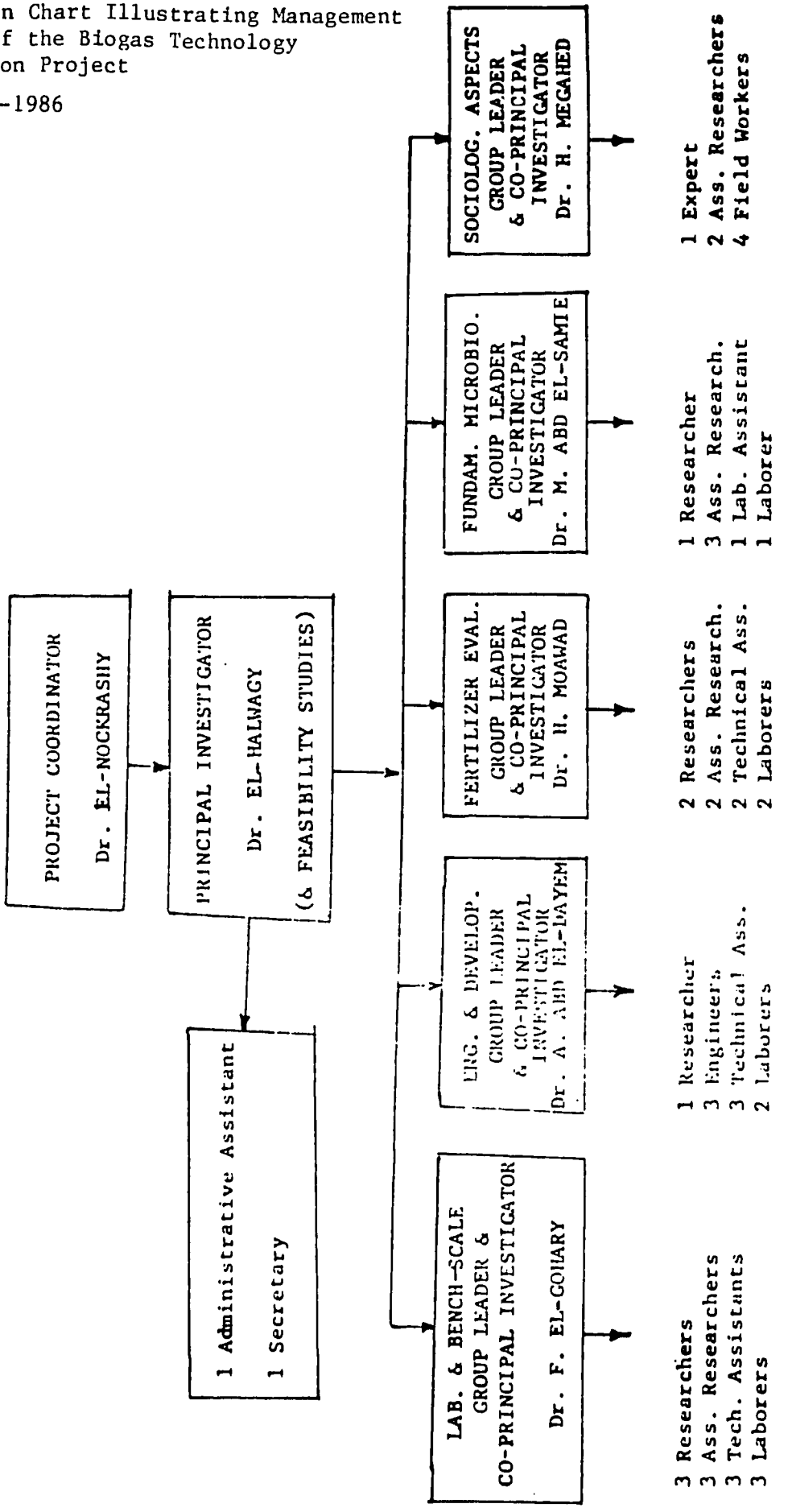
2- Identification of the proper end-user.

Annex 5

Applied Science and Technology Research Program

Organization Chart Illustrating Management Structure of the Biogas Technology Demonstration Project

1979-1986



Attachment C

EXECUTIVE SUMMARY

IMPACT OF THE MORE AND BETTER FOODS PROJECT

ON

SOCIOECONOMIC AND NUTRITIONAL CHARACTERISTICS

OF LIFE IN THE STUDY COMMUNITIES

Osman Galal
Amin Abdou
Abdel Rahman El-Seidi
Gail Harrison

November 1985

INTRODUCTION

An assumption underlying most agricultural development projects is that improving farm productivity will increase the real income of families dependent on agriculture and that this in turn will lead to an improvement of their quality of life. The actual impact, however, has seldom been investigated.

Food consumption and nutritional status offer reasonable avenues of access to this assessment. They are convenient variables which summarize a great deal about the quality of life and are sensitive, under the conditions of life in most rural areas of developing countries, to changes in income, food supply, sanitation, disease exposure, work requirements and time available for household and child care. Improved nutrition is often assumed to result from increased food production, either through enhnaced ability to purchase food in the market or through an increase in consumption of home-produced products. Thus improved nutritional status, and favorable changes in food consumption patterns, are logical goals for agricultural development projects and may be used as a measure of the impact of such processes on the life of the farmer and his family.

The purpose of this report is to summarize the results of an agricultural demonstration project, "More and Better Foods," in terms of the socioeconomic and nutritional effects on the participants in two Egyptian villages. The results of the project in terms of agricultural productivity and changes in farming practices and in terms of enhanced capability of the scientists and institutions involved, are available elsewhere.

land, while Kafr El-Khadra is typical of traditional Nile delta communities. Selection criteria included comparable size (5-10,000 population), agricultural base depending mainly on traditional food crops, available basic infrastructure, absence of other major projects, and absence of unusual nutritional conditions.

Baseline socioeconomic, nutritional and agricultural data were collected from about 100 households in each of the two communities in 1980. It was anticipated that these data would be used to evaluate the ultimate impact of the project as well as be useful in project planning. At the same time, a series of activities was implemented which was designed to increase the productivity of both plant and animal food crops. Studies were also implemented to assess farmers' knowledge of the plant and animal species they dealt with, cultivation practices, harvesting and storage practices. Several direct nutrition intervention projects were also implemented, directed toward supplementing the quantity and quality of the diet for children. In 1984, the community socioeconomic survey was repeated and additional data on agricultural production, disposal of agricultural products, reasons for participation/nonparticipation in project activities, and other relevant data were gathered.

The specific activities of the demonstration project were carried out in a series of subprojects, most of which focused on the production of particular food crops. Technology and information were made available specifically in relation to wheat, peanuts, onions, corn, grapes, citrus, poultry, tomatoes and other crops. In addition, trace element supplementation of plant products was achieved through use of a fortified fertilizer, after demonstration that the soil was deficient in

several trace minerals. A dairy project concentrated on processing of dairy products, especially cheese and yogurt, on a household and small factory level. Direct nutrition interventions included treatment of diagnosed iron deficiency anemia in school children, supplementation of the school lunch program, production and distribution of a fortified biscuit and of appropriate weaning foods for preschool children.

DESCRIPTION OF THE STUDY COMMUNITIES: HEALTH, NUTRITION AND SOCIODEMOGRAPHIC CHARACTERISTICS

Available data at the baseline period indicated that both villages experienced the high birth rates and relatively high infant mortality rates characteristic of rural Egyptian communities. Omar Makram exhibited a somewhat lower infant mortality rate than Kafr El-Khadra in the several years preceding the project (less than 100/1000 vs about 112/1000) but these rates fluctuated widely year to year in both communities. A small study of birthweights in Kafr El-Khadra revealed a normal distribution of weight at birth. Data collected on heights (or lengths) and weights of preschoold children indicated relatively good nutritional status in the period from birth to six months, with mild-to-moderate stunting becoming prevalent after that time and peaking at around 30 months. Little severe malnutrition was found. Iron-deficiency anemia was highly prevalent in the children of both communities.

Kafr El-Khadra is the more agricultural of the two communities, as well as the more traditional. Seventy-five percent of the Kafr El-Khadra households surveyed were primarily engaged in agriculture, com-

pared to 38 precent in Omar Makram. Kafr El-Khadra families relied to a greater degree on subsistence production to meet a portion of their household food needs. Fewer than ten percent of Omar Makram households in the sample relied on their own production for such staples as wheat, corn, dairy products, or poultry; about half the Kafr El-Khadra households produced all of their own wheat, corn and dairy products and almost 1/4 produced some or all of the poultry they consumed (see Table 1). Comparison of household characteristics in the two villages revealed that Kafr El-Khadra families had relatively greater per capita income and land holdings, and somewhat smaller household size (Table 2). Households in both communities reported spending a large proportion (more than 70%) of their household income on food.

Table 1. Household Food Consumption from Own Production (Percent of households)

	Omar Makram			Kafr El-Khadra		
	amount from own production					
Product	none	some	all	none	some	all
Wheat	92	1	7	39	19	42
Corn	92	1	7	46	2	52
Dairy Products	95	1	4	51		49
Poultry	93		7	77	6	17

Table 2. Baseline Sociodemographic and Economic Variables for the Two Village Samples (X ± SD)

	Omar Makram (N = 100)	Kafr El-Khadra (N = 104)
*Number of persons in household	6.8 ± 2.3	6.0 ± 3.0
*Per Capita Land Ownership (feddan)	0.2 ± .3	3.1 ± 3.1
*Per Capita Animal Ownership (animals)	0.1 ± .3	0.2 ± .3
*Income (LE/year/capita)	161 ± 97	206 ± 114
*Percent of household income spent for food	77 ± 11	72 ± 10
*Percent of household members who are children	49 ± 20	39 ± 25
*Number of rooms in house	3.0 ± 1.1	4.3 ± 2.3

*The communities differ from each other at $p < .05$, based on one-way ANOVA.

Based on the homemaker's recall of foods eaten by all household members in the preceding period, several variables were calculated to give a rough estimate of the adequacy of the household diet. Data on foods consumed were converted to energy, protein and iron intake using the Food Composition Tables of the Middle East. These levels were then compared to recommended intakes adjusting for the age and sex composition of the household, using 1973 FAO/WHO standards. The resulting variable, percentage of the overall household requirement met from the preceding day's reported intake, is referred to here as "relative adequacy" and taken as a measure of how well households were meeting their basic needs for food at the beginning of the project. Our focus is on energy, protein, animal protein, and iron, for several reasons. Since chronic stunting and anemia are both prevalent among children in both villages (and in all of Egypt), these dietary parameters address the most relevant nutrients. Energy and protein levels reflect primarily the quantity of food available, while animal protien and iron are indicators of the quality of the diet.

Table 3 presents the means and standard deviations for these variables at the beginning of the project. Households in both communities reported food intake adequate for presumed requirements in energy and total protein. The proportion of protein from animal sources, however, was much higher in Kafr El-Khadra. Iron intakes were quite low in both villages, but more than twice as high, on average, in Kafr El-Kahdra as in Omar Makrm. It should be borne in mind that the dietary methodology used here does not allow interpretation of results in terms of nutritional adequacy for any individual. Assuming that any biases operate for all households equally, however, these data should allow the comparison of housebolds with relatively better and poorer food consumption, both quantitatively and qualitatively.

Table 3: Relative Adequacy of Household Food Intake (percent of Requirements)

($\bar{X} \pm SD$)

	Omar Makram	Kafr El-Khadra
Energy	144 ± 52	133 ± 32
Total Protein	179 ± 70	191 ± 62
Animal Protein	65 ± 45	144 ± 83
Iron	20 ± 38	44 ± 34

Analysis of characteristics of households with relatively better and poorer diets revealed different circumstances for two villages. In Kafr El-Khadra, reliance on the household's own production for part of the food supply was positively associated with dietary quality (Table 4). Households which produced some of their own poultry for consumption had better diets in terms of all four dietary variables than households which did not. Reliance on self-production of other staples was also important. Per capita income was a significant predictor of protein, animal protein and iron adequacy (diet quality) but not of energy (food quantity). Larger land holdings and smaller household size were significant predictors of energy adequacy. In Omar Makram, smaller household size, higher per capita income, and higher percent of income expended for food were the only significant predictors of dietary adequacy.

Table 4: Production-Consumption Variables, Differences* for Households with High and Low Dietary Adequacy, Kafr El-Khadra

Self-production of all or part of consumption of:	Associated with adequacy of
Poultry	Energy, total protein, animal protein, iron
Wheat	Total protein
Maize	Total protein, iron
Dairy Products	Total protein

*$p < .05$

CHARACTERISTICS OF PARTICIPATING FARMERS

Farmers who chose to participate in the subprojects had, on the average, larger land holdings and larger family size then those who did not participate. Participation in a few subprojects (notably poultry and peanuts) rose steadily after the first year, while for others it was uneven or even dropped off after the first year. Interviews with participants and nonparticipants revealed that while some farmers chose not to participate because they did not see any potential benefit, others would have liked to participate by had insufficient resources to risk investing in the initial cost of participation or to risk the uncertainty of changing the allocation of their land or labour resources. Additional factors experienced by some nonparticipants included perceived administrative inequities/or dissatisfaction with the continuity of contact with the scientific personnel.

IMPACT OF THE PROJECT ON PARTICIPATING HOUSEHOLD ECONOMIES

Analysis of data on agricultural commodity production and disposal revealed that not only did the production of the targeted commodites increase in participating households relative to those who did not participate, but that the increase in production was utilized in several ways which might not be detected - or would be underestimated - by a focus on household income alone. Increase in production of staple crops

was followed by increases in household consumption from home production and in increased quantities of those commodities stored and used for animal feed. Thus, the participating farmers ended up with improved resources which they managed so as to maximize economic flexibility. Detailed analysis of the impact of the project is still proceeding, but the results which are summarized in the following pages on wheat and corn, the two major economic staples, are illustrative.

Wheat: participating farmers cultivated two new varieties of what, while nonparticipating farmers continued to cultivate balady wheat. A stratified random sample of 34 participating and 17 nonparticipating farmers in Omar Makram and 17 participants and 17 nonparticipants in Kafr El-Khadra was selected to compare productivity, determinants of productivity, and disposal of the wheat crop in the two villages in 1984. While the total land area devoted to wheat did not differ between participants and nonparticipants, productivity was higher by 36% and 16%

Table 5: Production and Disposal of Wheat in 1984, Participants or non-participants

($\bar{X} \pm SD$)

Variables	OMAR MAKRAM		KAFR EL-KHADRA	
	Part.	Non-Part.	Part.	Non-Part.
	(N=34)	(N=17)	(N=17)	(N=17)
Total area cultivated in wheat (Feddan)	1.4 ± .6	1.3 ± .4	.6 ± .3	.8 ± .4
Seed Productivity (Ardab/Faddan)	13.8 ± .6 *	8.7 ± 2.1	14.1 ± 1.5 *	11.9 ± 3.1
Wheat By-products (Straw) Productivity (HEML/Feddan)	12.4 ± 1.2 *	9.1 ± 2.1	12.5 ± 2.0 *	10.9 ± 2.5
Wheat Stored (Ardab)	7.2 ± 3.3 *	8.1 ± 4.0	5.6 ± 1.3 *	4.6 ± .3
Wheat from own Prod. Consumed by household (Ardab)	5.9 ± 3.2 *	3.4 ± 1.8	4.5 ± .3 *	4.1 ± .2

*Participants vs non-participants differ at $P < .05$, by ANOVA

in Omar Makram and Kafr El-Khadra respectively for participating farmers compared to non-participants. Productivity of straw, a by-product which is of great economic importance because of its use as animal feed,also increased significantly (9% and 13% in Omar Makram and Kafr El-Khadra respectively). Stepwise linear regression analyses indicated that when land area devoted to wheat, amount of seed planted, fertilizer inputs, human and animal work were controlled for, the type of seed significantly affected productivity.

Data on disposal of the wheat crop focused on the proportion of crop going to home consumption, storage as seed for future crops, storage as seed and as straw for animal feed, and sales. Participating households consumed a greater share of the household wheat consumption from their own production than non-participants (36% vs 29% in Omar Makram and 66% vs 54% in Kafr El-Khadra). Participating households consumed about 89 kg wheat/per capita/per year from their own supplies in Omar Makram compared to 78 kg per capita in non-participating families. In Kafr El-Khadra per capita consumption from household production was 111 kg per year for participants and 80 kg per year for nonparticipants.

Participants stored significantly more wheat than non-participants in both communities. The quantity of straw stored for animal feed was significantly greateer for participants than non-participants in Kafr El-Khadra; in Omar Makram the amount of straw sotred was directly dependent on the number of cattle owned.

Corn: Based on a stratified random sample of farmers, corn produc-

tivity and disposal in 1984 was investigated. As with wheat, productivity for corn was significantly greater for participants than non-participants in both villages. Disposal of the corn crop was to animal feed, sales and household use (to mix with wheat for baking bread). The proportion of production used as animal feed was higher for nonparticipants - (i.e., total productivity was lower, and the amount needed for animal feed was fairly constant and thus it was the amount available for home consumption which increased for the participants.) Thus it appears that the farmer uses corn first to feed his animals, with excess production over that amount going to home consumption and sales. The increased productivity enjoyed by MBF participants thus directly affected the amount consumed by the family from its own resources (Table 6).

Table 6: Production and Disposal of Corn in 1984, Participants or non-participants

($\bar{X} \pm SD$)

Variables	OMAR MAKRAM		KAFR EL-KHADRA	
	Part. (N=36)	Non-Part. (N=19)	Part. (N=16)	Non-Part. (N=19)
Total area cultivated in corn (Feddan)	1.4 ± .5	1.3 ± .5	1.3 ± .7	1.1 ± .8
Productivity (Ardab/Faddan)	14.9 ± 3.0 *	9.7 ± 2.7	13.2 ± 2.6 *	10.4 ± 1.6
Seeds Stored (KILLA)	10.6 ± 6.7 *	6.8 ± 8.6	9.5 ± 5.4 *	3.8 ± 3.2
Amount to Animal Feed (Ardab)	3.5 ± 2.9	2.4 ± 1.5	3.9 ± .3 *	2.7 ± 2.2
Corn from own Prod. Consumed by household (Ardab)	4.7 ± 2.9 *	2.8 ± 1.3	2.8 ± 1.7	15 ± 1.6

*Participants vs non-participants differ at $P < .05$, by ANOVA

Thus for the two important staple grains, increased productivity was reflected in increases in stored grain and stored animal feed, and greater self-sufficiency. Given the finding that at the beginning of the project reliance on home production was associated with relatively more adequate household food intake, these findings would seem to point in the direction of a better diet for the households who participated. The data for both staple cereals also point to the priority of these crops for the provision of animal feed, as corn and as straw.

Attachment D

TRAVEL FROM EGYPT

October 1 - December 31, 1985

NAME	DATE	PURPOSE	PLACES VISITED
PROGRAM PLANNING AND MANAGEMENT			
1. A. S. El Nockrashy ASRT Program Coordinator	Oct. 19-31	Review of program schedules; preparation of final reports; preparation of JCC agenda	NAS/NRC, Washington, D.C.
MORE AND BETTER FOOD (MBF)			
2. Amin Ismail Abdou Professor of Agricultural Economics, NRC/Cairo	Oct. 18-Nov. 2	Completion of data reduction and analysis for nutrition/ health aspects of MBF final report	Department of Family & Community Medicine, University of Arizona
3. Abdel R. El Seidi Professor of Agricultural Economics, Fayoum University	Oct. 18-Nov. 2		International Food & Agricultural Development, Tennessee State University

TRAVEL TO EGYPT

October 1 - December 31, 1985

NAME	DATE	PURPOSE
PROGRAM PLANNING AND MANAGEMENT		
1. Jay Davenport Staff Officer, BOSTID	Nov. 17-Dec. 9	Program management JCC-XVI
2. Gilbert White	Nov. 22-Dec. 1	JCC-XVI
3. George Bugliarello	Nov. 22-28	JCC-XVI
4. William A. W. Krebs	Nov. 24-28	JCC-XVI
5. Karl Willenbrock	Nov. 22-28	JCC-XVI
6. John Hurley Director, BOSTID	Nov. 22-28	JCC-XVI
MORE & BETTER FOOD		
7. Gail Harrison Department of Family & Community Medicine, University of Arizona	Nov. 1-7	Analysis of nutritional data for incorporation into final report
8. Troy Wakefield International Food & Agricultural Development, Tennessee State University	Dec. 14-30	Further analysis of data for final report
R&D MANAGEMENT		
9. James Blackledge Consultant, Denver, Colorado	Nov. 21-Dec. 9	Review project results and recommend future actions
PREPARATION OF SELECTED PHARMACEUTICAL CHEMICALS		
10. Fay Cunningham Director, Specialty Chemicals Products, The Upjohn Company	Nov. 30-Dec. 11	Observe start-up of pilot plant operations for the first of the 9 drugs to be synthesized